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ORIGINAL COMMUNICATIONS.

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THE NEED OF A STANDARD IN VOICE PRODUCTION.*

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Ferrein's treatise on the vocal organs was published in 1741. But it was more than half a century later that his ideas appeared to have any general influence. In the first thirty years of the nineteenth century several works on the same subject were put forth. Not, howver, till Garcia invented the laryngoscope, in 1855, was there any real scientific application of the study of physiology to singing. Since that time the growth of vocal science has been large and methods of investigation of the formation of the singing tone have advanced far beyond the fondest dreams of Garcia.

Cerone, a Spaniard, published in 1613 his "Il Melopeo," a treatise on the rules of singing. In it we learn that at this period chest and head registers were recognized, that the classification of voices according to their timbers had been made, that emission ot tone had been studied and reduced to a system, and that style and hygiene of the voice were both considerations in the daily curriculum of the studios. Lest we permit ourselves to be astonished we must recall the historical fact that Pope Sylvester founded singing schools in 1314, and that the church music was taken out of the hands of the congregation and placed in those of a trained choir as early as 367. In Cerone's day all the vocal ornaments performed by Tetrazzini were familiar to such famous singers as

*Read by invitation at the annual meeting of the American Laryngological, Rhinological and Otological Society, May 13, 1912.

Victoria Archilei and Leonora Baroni. In fact, the whole foundation of the so-called "Italian method" had been laid. The codification of its laws was completed in the course of the seventeenth century, and when the great schools of 1700 were sending forth such famous singers as Farinelli, Caffarelli, Cuzzoni and Faustina, everything was known about singing that is known now—except the physiological laws. Of those, nothing whatever had been discovered, yet these schools produced the greatest singers the world has ever heard.

Now what is the matter? Is the physiological basis of singing of no practical value to the singing teacher? In the time of Porpora, Leo, Redi, and the other eminent teachers of the early eighteenth century the empirical method of instruction was the only basis of vocal art. Let us, if you please, call it the suggestive method. Its fundamental principles are set forth in Tosi's treatise. To allow the voice to flow freely without nasality and without throat constriction was the prime requisite. This was taught by example and by helping the pupil to acquire mental conceptions of the required tone. He was shown that the most important of all things for him to accomplish was perfect freedom. He must never let his throat or his nose interfere. Which, of course, meant that he must never shut off any of his resonance chambers or exert any muscular effort antagonistic to a perfectly normal condition of the organs. This empirical, psychological or suggestive method of teaching was the exclusive basis of vocal art up to the time when the physicians began to publish their descriptions of the tone-forming organs. During the years when the empirical method was employed apt pupils acquired a vocal method so excellent as to enable them to conquer the world. Shall we, therefore, say that the revelation of scientific knowledge of tone-formation has worked injury to vocal art? For we know that ideal tone-production is excessively rare among the singers of to-day.

The fault is assuredly not to be laid at the door of science, for the progress of science makes truth clearer. It is undeniable that up to the present we have not acquired a complete body of indisputable scientific laws, for the doctors do not yet agree. We cannot hesitate, however, to declare that among the differences as to details which are found in the publications of voice investigators we have yet to find any final demonstration of basic error in the musical conception of tone acquired by the first great masters of song.

What is it, then, that is wrong? I decline to assume the responsibility of deciding. But while for some centuries the psychological or suggestive method of teaching was the only one in use, there has not been a time when the scientific or physiological basis has been exclusive. I will venture to express my belief that it never can become the exclusive basis, but no educated man will deny that its acquired facts demand recognition by voice teachers. The only certain knowledge is that which is capable of scientific demonstration.

Every scientist will agree that an accurate and informing terminology is a first desideratum of knowledge. It is there, I think, that the chasm between the teacher and the physicist remains as wide as it was in the beginning. Too many vocal teachers have been alarmed at the apparent intricacy of the physiology of the organs of tone. They have perhaps looked timidly into some of the simpler treatises, such as Sir Morell Mackenzie's "Hygiene of the Voice," have gathered a few uncertain ideas, and have forthwith endeavored to apply them to their practice.

They have struggled vainly to reconcile their construction of the meaning of the time-honored figurative terminology of their profession with some scientific facts set forth by physicians. They have had a stock of names, such as chest and head registers, invented in the childhood of voice study in order to designate ideas conveniently which could not then be designated scientifically. They have tried to make these terms square with physiological theories. They sometimes inform their pupils that head-tones find their entire resonance in the frontal sinus and chest-tones in the lower pharynx. Some have even located tones in the sphenoidal sinus. I take it for granted that no laryngologist within the sound of my voice believes that any beautiful and correct singing-tone can be produced without a harmonious operation of all the resonating cavities.

The pupil who forms a picture of his highest tones as vibrating in the topmost resonance chambers sometimes arrives at a notion that these chambers are directly concerned in establishing the pitch of the tone, and thus we find not only some students, but also some teachers, talking learnedly about throwing the upper tones up into the head in order to get them at all. Such ideas rest upon insufficient scientific information and upon a worn-out and misleading terminology. It is pretty generally accepted in these days that pitch is determined at the seat of tone formation, the larynx, and that the resonating cavities are not creators, but qualifiers.

It seems to me that the path out of the wilderness must be opened by the co-operation of scientific investigators of tone-formation. It is for them to formulate the vital facts and to present them in language which will clear away all confusion of terms and consequent confusion of ideas. Every singing teacher ought to be thoroughly acquainted with the physiological basis of voice instruction. Every medical student of vocal organism should recognize the boundaries which separate the physiological laws from the psychological. In this way a general and authoritative science might be built up, and upon it a correct method of teaching tone-production. An end would be put to the ridiculous claims of those teachers who assert that they have a method different from any other and therefore far better. The real value of the teacher would be determined by his skill in teaching established truths, not by his assurance in boasting.

This blissful state can be attained only by a closer union between teachers of the gentle art of voice production and physicians and other scientists who make a special study of the operation of the vocal organs. The radical evil of vocal teaching at this time is the endeavor of singing teachers who do not understand the physiology of the throat to make their pupils get results by the voluntary movement of certain muscles. It is susceptible of scientific demonstration, unless I am utterly mistaken, that many essential muscles in the formation of tone are involuntary muscles and cannot be directed by the will.

But there are many other muscles which can be directed by it and which can be brought to bear on the organs of the throat in such a way as to interfere with normal tone-formation. And it is these muscles which some teachers are causing their pupils to operate incorrectly, to the enormous detriment of their singing.

Exposure of this evil lies within the province of the scientific investigator. But the teacher must be sufficiently fond of the truth and not too devoted to his own ill-grounded claims to originality to accept a scientific fact when it is held up before his eyes.

I may perhaps be pardoned if in closing I refer to my own calling. The exigencies of daily newspaper writing preclude the possibility of detailed or scientific voice analysis; but it is my humble opinion that the generalizations which constitute the vast bulk of newspaper comment might, without great difficulty, be brought into closer harmony with scientific truth and by precisely the same means as teaching should be.

Hotel Gerard.

THE RESULT OF EIGHTEEN YEARS OF RESEARCH WORK ON VOICE PRODUCTION AND ANALYSIS.*

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Our belief in the results of any investigation should be based, largely, upon the method used in carrying it out. All scientists are agreed that there is but one mode of procedure by means of which we can be at all certain that we have arrived at the truth in any investigation. This is what is termed the "Scientific method." We present here an abstract of this showing not only the different steps necessary to be taken, but how we have applied it to our inquiry into the voice and its mechanism.

SCIENTIFIC METHOD.

A. Definition—air-waves.

B. Analysis.

C. Classification—I. Pitch—Length of wave. II. Intensity and carrying power—height of wave. III. Quality—number and relative intensity of partial tones.

D. Relationships and sequences of classes of facts—I. 1. Length of vocal cord. 2. Weight of vocal cord. 3. Tension of vocal cord. II. 1. Extent of swing of cord. 2. Resonance. III. 1. Segmentation of cord. 2. Resonance.

E. Natural law—relaxation of extrinsic muscles.

It is seen that the first step is definition, that is we define or limit our field of research. Voice is defined as sound. Sound is defined as air-waves. Voice-production, therefore, is simply the production of air-waves and is subject to the mechanical laws which govern this. Complete knowledge of a subject implies the ability to give a complete description of it. A complete description necessitates an analysis of whatever we are describing; hence analysis is the second step in the scientific method. The voice is always a complex tone, that is, it is composed of several tones varying in pitch and intensity. These are called the partial tones or the fundamental overtones of the voice, a complete knowledge or description of the voice, therefore, necessitates a separation of it into its partial tones and a record of this separation, so that we can describe each one separately and all of them collectively. To do this we made

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use of the Helmholz spherical resonators and a greatly modified form of the Koenig monometric capsule. We then devised a method of photographing the motion of the little monometric flames and our analysis and record were complete.

Figure 1 is a front view of the apparatus showing the resonators, a glimpse of the flames, and the position of the camera.

Figure 2 is another view, showing the manometric capsules, their little flame reflected in the revolving mirror and the sliding plate holder at the back of the camera.

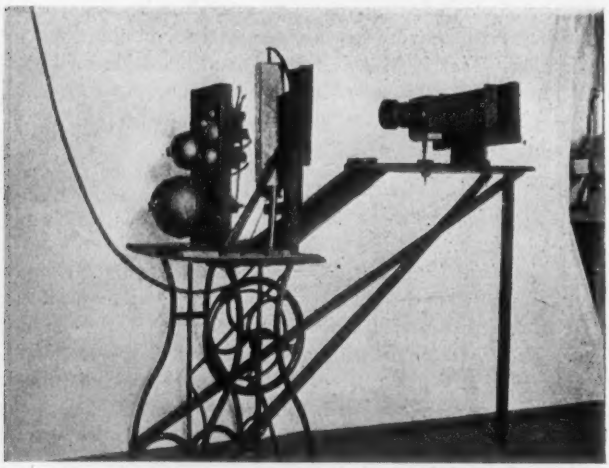


Figure 1.—General view of the apparatus, showing the resonators, the rotating mirror and the camera at the back.

Figure 3 is the section of a resonator and its manometric capsule showing how the vibrations of the air are changed into the vibration of the little flame. The flames were focussed in a small slit at the back of the camera. By means of a sliding plate-holder shown in Figure 2, a sensitive plate was drawn quickly across this slit giving a trace of each flame and its motion on a different part of the plate and the record was complete.

Figure 4 shows such a record.

Our apparatus is tuned to the base C-128. V. p. s. The overtones are in the ratio of 1 in the fundamental to 2, 3, 4, 5, 6, 7, respectively in the overtones. A peculiarity of the spherical resonator is that it is very selective. It will only respond, normally, to a single pitch. A series of these tuned to the pitches represented

by the partial tones of the voice will thus separate them one from the other and the analysis is made. The capsules change these air-waves into flame vibrations of the same rate while the camera gives us a permanent record. Our apparatus is then analagous to that of the ear. The resonators correspond to the external ear. The capsules to the middle and internal ear which change the vibration of the air into vibration of nerve filaments while the sensitive plate corresponds to the brain-cells where the record is finally made. Our apparatus, however, gives much more definite results because we have a resonator for each partial tone, a membrane to respond to

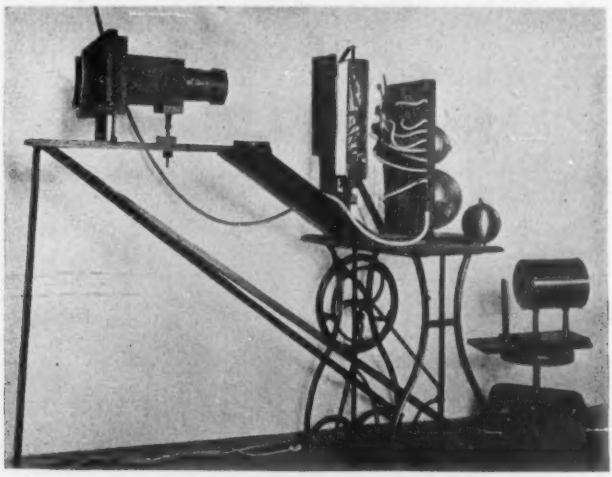


Figure 2.—General view showing the capsules and their attachments, the flames reflected in the mirror, and the sliding plate-holder at the back of the camera. A spherical resonator stands on the corner of the table and our standard tuning fork with its cylindrical resonator is on the low stool.

each series of air waves, and finally a record which may be appreciated by the sense of sight by means of which a clear and complete description may be given. This gives our next step in the scientific method, viz: classification of facts. A study of this voice analysis shows us that the pitch varies with the length of the wave and our first class of facts is, pitch—length of wave. Our experiments demonstrated that the fundamental tone or the one with the highest wave had the greatest carrying power and that this diminished in direct proportion to the lessening of the height, hence our second class of facts is: intensity and carrying power-height of

wave. Our experiments also showed us that any change in the number or relative intensities of the partial tones made a corresponding change in the quality and hence our third class of facts is quality-number and relative intensities of the partial tone. A critical examination of this voice photograph shows that there is nothing further to describe and hence our classification is complete. Every fact which has any bearing on the voice may be placed under one of these three classes.

Our next task was to trace out the causes which lie back of each class of facts and to show how these different series of causes are related to each other. This comprises the fourth step in the scientific method. What is it that determines the length of the wave or the pitch of the tone? To answer this question we must know to what class of instruments the vocal apparatus belongs. An ex-

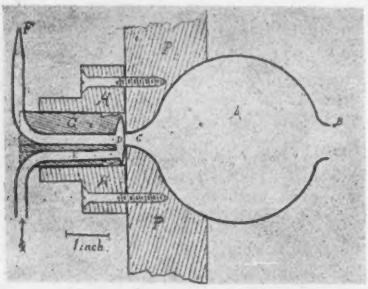


Figure 3.—Section of resonator and its manometric capsule. A. Resonator. B. Mouth of resonator where air-waves enter. C. Small extension through which the air-waves strike upon the rubber drum between D and C. D. Space behind the drum to which the gas enters through the tube E, and from which the gas passes out and burns at F. G. Wooden plug carrying gas tubes and hollowed out to form the space D. The rubber is stretched and tied over the end of G. H. Block to hold G. P. Plank on which the whole is mounted.

haustive examination of the whole range of musical instruments reveals the fact that only the characteristics of string instruments will satisfy the conditions involved in the vocal mechanism. The pitch of the fundamental tone is determined by the length, weight and tension of the vibrating cord. These are the factors which regulate the pitch of any string. The larynx is the pitch mechanism and is composed of a number of cartilages joined together in such a manner as to be movable upon each other. These serve as levers upon which the intrinsic muscles act to give us the changes in length, weight and tension for variations in pitch. Figure 5 repre-

sents some photographs of the vocal cords which shows the lessening of the vibrating length of the cord in raising the pitch. Figure 5 shows four photographs of the vocal cords, looking down upon them. The front attachment is out of sight at the bottom of the pictures, being covered by the epiglottis; *l* is the cords themselves, with the apparent slit, *k*, between them; at the back, *bb* are the arytenoid cartilages. The "vocal muscle" is attached to the outside of the arytenoid cartilage at a point near *n*. It extends forward through the thick part of the cord and is attached near the cord to the front

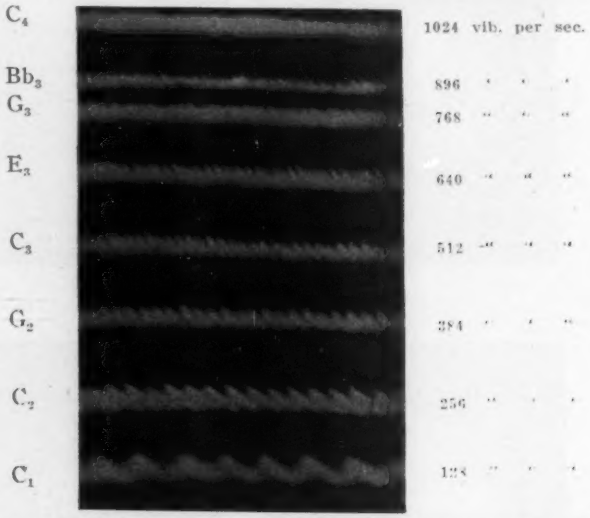
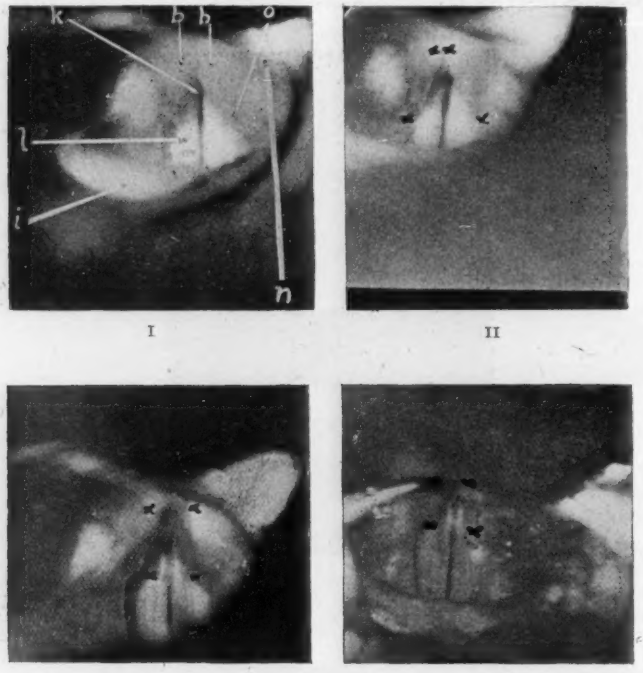


Figure 4.—Photograph of the motion of the flames while singing the vowel a as in father. The lower line is the fundamental, and the others are the 1st, 2d, 3d, etc., overtones in the order of their pitch. One wave of the fundamental corresponds to two in the first overtone, three in the second, four in the third and so on.

of the thyroid. When these muscles are contracted they cause the arytenoids to rotate around a point near *bb*, throwing the forward ends, *o*, inward toward each other. This rotation of the arytenoids results in a shortening of the effective length of the cords and a consequent raising of the pitch. In I and II the person is singing low G, and the whole length of the cord is in vibration. III shows the position when the octave G (bass clef) is sung, and IV when G (middle G) is the tone. A comparison of II, III, and IV, especially as to the position of the crosses marking

the front and rear points of the arytenoids, will show how the cartilages are rotated and the cord shortened as the pitch rises. The rotation of the arytenoid cartilages and the consequent shortening of the vibrating cord is effected by contraction of the thyro-arytenoid muscle which also sends fibers into the substance of the cord itself.

Figure 6 is a schematic representation of the vocal cord, showing the location of the vocal muscle *m*, and how it sends its fibers



I II III IV

Figure 5.

into the body of the cord. When *m* is uncontracted, or but slightly so, the cord may vibrate from the edge as far back as *r*, but as *m* is tightened more and more it holds the vocal cord first as far as *s*, then *t*, and finally for the highest tones (IV, Figure 5) only the part between *u* and the edge *k* is allowed to vibrate, giving a much lighter string and thus helping to get a high pitch with a minimum of tension.

Figure 7 shows three views of the larynx: I, a section vertical from front to back; II, the left side of the cartilages; III, the left side with some of the muscles. *e* is the large thyroid cartilage, the front point of which forms the "Adam's apple," just behind which is the front attachment of the vocal cords. This cartilage is hinged upon the cricoid, *a*, by two projecting horns, *d*. Upon the back, top part of the cricoid sit the two arytenoid cartilages *b*, which form the rear attachment of the vocal cords. The thyroid is held in place by muscles running up to the soft palate and head, and down to the collar-bone. When the muscles *h* are contracted, the front edge of the cricoid is drawn up, closing the niche *c*, and tilting on the hinge *d*. The back top of the cricoid, with the arytenoids, is

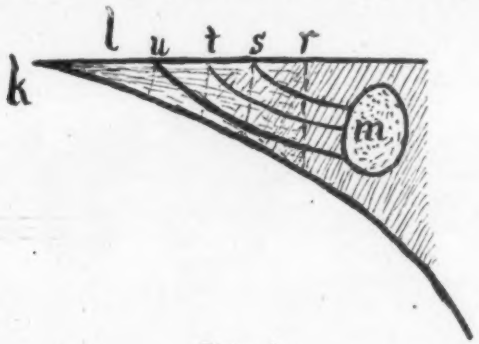


Figure 6.

thereby carried backward, lengthening the cords slightly and stretching them more tightly.

It will be seen that we have in the larynx the means for controlling the three factors which determine the pitch of a string—length, tension, and weight. Moreover, the tuning mechanism of a reed, plate, or membrane is lacking. Actual analysis shows the overtones of the vocal cords to belong to the series of a string, and not to that of a reed, plate, or membrane. We are thus forced to the conclusion that, both in its action and in its resulting tone, the larynx is a string instrument. The fact that the pitch relation of the overtones to the fundamental is so absolutely definite, never varying so much as a vibration from the ratio of one in the fundamental, to 2, 3, 4, 5, etc., in the overtones, can be accounted for in no other way than by the string segmentation of the vocal cords.

The height of the wave (intensity and carrying power) is controlled by two factors, viz: the extent of swing of the cord and

resonance. Of these two resonance is of vastly more importance. While the increased swing of the cord may amplify the wave twenty-five or thirty fold, it can be demonstrated that resonance will increase the height several hundred fold. Increased swing of the cord is brought about by increased breath or pressure and hence the expenditure of energy.

Full use of resonance can only be attained by absolute lack of effort. It is a free gift. This will be explained later. Resonance, then, is *the* important factor in intensity and carrying power or the second class of facts.

In the etiology of quality or the third class of facts, we also have two factors: segmentation of the vocal cords and resonance. It has been proved that the cords segment in the same manner as the

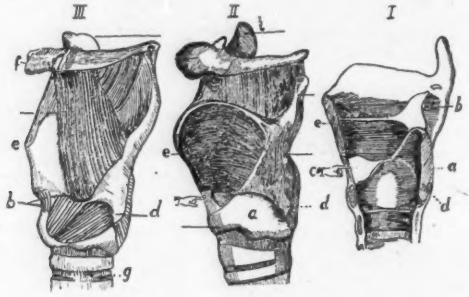


Figure 7.

string and Figure 8 is a photograph of a string while vibrating showing its segmentation.

It is now clear why the overtones must bear the same pitch relation to the fundamental no matter what the pitch of the fundamental may be and how impossible it is even to build an apparatus to produce these overtones even for a single pitch to say nothing of the whole range of the voice. We know that no other overtones are present because we have listened for them with resonators not only through the whole range of the voice, but of its overtones as well. The amplitude of the waves composing the various partial tones is very small when they leave the cords and without reinforcement would have little or no effect on the auditory apparatus. They are made larger or amplified by the air in the resonance cavities and this is what we term resonance or the second factor in quality. For our purpose resonance may be defined as the re-enforcement of a tone by a quantity of more or less con-

fined air, the inherent rate of vibration of which is identical with that of the tone re-enforced. Such a quantity of air receiving successive impulses from the vibrating object comes into vibration itself, thus giving to the surrounding air a much greater amplitude of vibration and consequently greater intensity and carrying power of the tone. The jew's-harp is an excellent illustration. In it the mouth cavity re-enforces the tones of the little tongue. In fact the size of the cavity in this case, selecting its own pitch from the complexity of sounds produced by the harp, and so re-enforcing it, makes it the characteristic tone, which varies with the size and shape of the mouth cavity. To a lesser extent do the cavities of

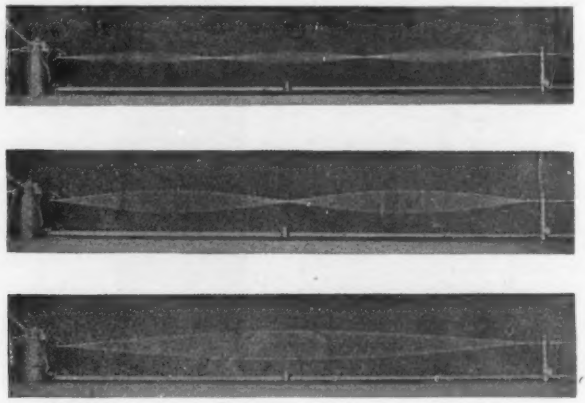


Figure 8 illustrates vibrating string showing segmentation. A string vibrating in this way would give a pure and simple tone. B shows the same string as A, only now vibrating to the first overtone. In C we have the second overtone the fifth above the octave, with two nodes and three segments, and with one-third the effective length of A.

the mouth and nose act selectively upon the tones produced by the vocal cords, thus modifying the quality of the tone, as in articulation, but never determining the characteristic pitch (fundamental), which is entirely controlled in the larynx. This point will be more clearly brought out when we consider interference. Resonance, then, becomes the most important element in voice-production as it is the chief factor in both intensity and carrying power and quality. It is necessary, therefore, to know how it may be obtained or what material is available in the vocal mechanism for its production. Sounding-board effects are impossible, as dryness and homogeneity of texture, the two essential features of these are not found in animal tissues. An opening of considerable size so that

the air-waves may pass in and out freely is the essential feature of resonance cavities. During voice production the pharynx, mouth and nasal cavities are the only ones possessing this characteristic and hence the air in them is our only means of reinforcing the air-waves set up by the vocal cords. The management of these cavities, therefore, becomes of the utmost importance. An exhaustive study of use made of these cavities and the results as shown by our voice analyses demonstrate that every particle of space is needed to produce the desired results. In the nasal spaces are the small

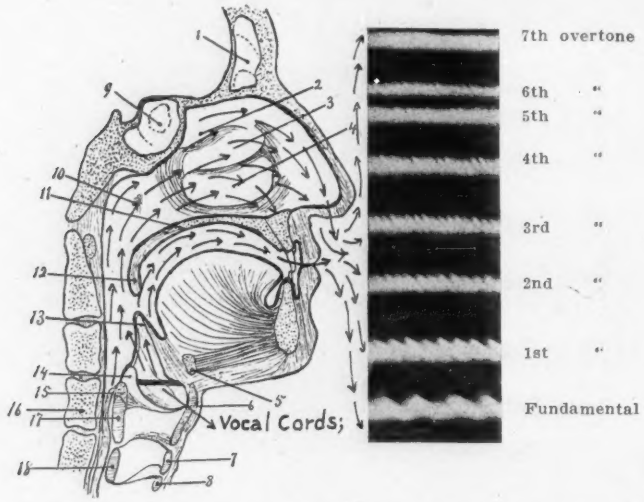


Figure 9.—Vertical section of the head to show location and relative size of the resonance cavities. 1. Frontal sinus; 2, 3, and 4. Turbinated bones; 5. Hyoid bone; 6. Thyroid cartilage; 17. Cricoid cartilage; 7 and 18. Top ring of the trachea; 9. Sphenoidal sinus; 10. Epi-pharynx; 11. Hard palate; 12. Soft palate; 13. Epiglottis; 14. Arytenoid cartilage; 15. Arytenoideus muscle; 16. Vertebra.

cavities essential to the reinforcement of the higher partial tones. The combined space represented in the pharynx, mouth and nose gives the large cavity essential to the reinforcement of the fundamental the *sine qua non* of good quality. The cavities of the lower and upper pharynx and the nose furnish a permanent factor in reinforcement. The size and shape of the mouth cavity made variable by the action of the tongue and lips enables us to reinforce the different combinations of partial tones essential to the production of the vowel sounds. The complexity of the cavity as a whole ren-

ders it non-selective and thus capable of reinforcing a wide range of pitch. Large size and complexity of shape of our resonance space is essential to good intensity and carrying-power and quality. To sum up the whole matter of correct voice production we state: There must be absolute freedom of motion of the cartilages of the larynx that any desired pitch may be obtained without effort on the part of the producer; 2, there must be a perfectly free vibration of the vocal cords that the proper combination of partial tones may be started by them; 3, there must be the fullest possible use of our resonance space that the requisite reinforcement may be attained. Any action of the throat-muscles which prevents the free

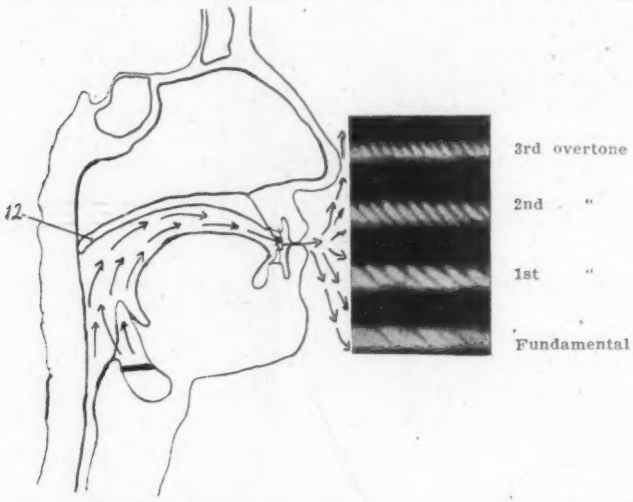


Figure 10.—Vertical section of the head similar to Figure 1, but showing how raising the soft palate, 12, and closing the passage diminish the space available for resonant re-enforcement by cutting off the large cavity of the upper pharynx and nose.

use of any one or all of these factors must be termed an interference.

The principal muscles whose contraction does interfere with correct voice-production are those of the soft palate, the constrictor muscles of the pharynx, the muscles of the back part of the tongue, the genio-hyoid, the muscular fibers of the false vocal cords and those surrounding the ventrical of the larynx. These are termed extrinsic muscles of the larynx in contra-distinction to the intrinsic or true tone-producing muscles whose function it is to control the

vibration of the vocal cords through the motion of the cartilages to which they (the cords) are attached.

We will now show how the contraction of the extrinsic muscles interferes with resonance (and hence with intensity, carrying power and quality) and also with the free motion of the laryngeal cartilages and consequently with pitch. The two most pernicious interferences are those of the soft palate and the false vocal cords. Figure 9 shows a section of the head and throat, with the soft palate in the correct position to allow full use of the resonance cavities, and an analysis of the resulting tone. In this tone there is practically no interference except that of the false vocal cords and the geniohyoid muscles. If these had not been present the waves in all the

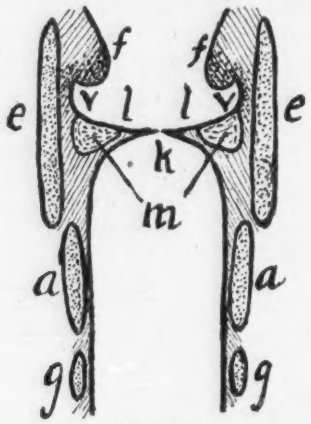


Figure 11.

partial tones especially that of the fundamental would have been stronger and more distinct and the tone vastly improved in intensity and carrying power and quality. However, we have here a fairly good representation of what the ideal tone should be. The fundamental tone has the highest wave and the waves of the overtones gradually diminish in height as we go up in the series but all are present. This is as it should be. The strong fundamental gives that ringing quality which is so much to be desired while the higher overtones give a certain richness which can be acquired in no other way. The tone produced by a tuning fork and its resonator is a pure fundamental and some idea of the desired quality may be gained by listening to this. The presence of the eight partial tones gives the material for making the different combinations essential

for the production of the vowel sounds as well as the expression of the different emotions. The cavities of the pharynx, mouth and nose acting as one give the large space essential to the proper reinforcement of the fundamental. The small cavities of the nose furnish the small spaces (1, 2, 3, Figure 9) necessary for the reinforcement of the higher partial tones. Therefore a tone is produced which is rich, musical and resonant. Figure 10 shows the interference of the soft palate and its effect on the resulting tone. When the soft palate (12, Figure 9), contracts it is pulled upwards and backwards against the back of the throat (as shown by 12, Figure 10) shutting off the largest space of the epi-pharynx (10 Figure 9) and also the small spaces in the nose (1, 2, 3, Figure 9). The remaining resonance space is not sufficient to properly reinforce the fundamental tone and its wave is very small. The four upper partial tones are not present at all due to the shutting off of the small cavities of the nose. This combination of partial tones gives a harsh, disagreeable and unmusical tone. In Figure 10 we have only four partial tones with the fundamental weak and the partial tones increasing in strength as they rise in the series. The contrast in quality between these two tones is very marked and the interference of the soft palate can be readily detected by the trained ear.

The interference of the false cords may be understood by a reference to Figure 11. *LL* are placed just above the true cords. *K* just below the glottis. *M* indicates the position of the vocal muscle. *V* is the ventrical of the larynx and *ff* show the false vocal cords. The function of the ventrical of the larynx is to afford a free space for the true cords to vibrate in and they also contain numerous mucus glands which furnish mucus to keep the vocal cords moist. The false vocal cords have no function in tone production. During the acts of swallowing and lifting they approximate and keep the food from dropping into the larynx when we swallow and the air escaping from the lungs when we lift. The ventrical of the larynx is practically surrounded by muscle-fibers as shown by the black dots in the figure. When these, together with the false cords contract they pull the walls of the ventrical inwards upon the true cords and thus interfere with their free vibration. This cuts down the height of the air waves as they are being started by the cords and we do not get the proper combination set up. The interference of the false cords gives a certain roughness or harshness to the tone which is unmistakable once it is recognized. Any contraction of the constrictor muscles of the pharynx narrows this space. Pull-

ing down the back of the tongue pushes the epiglottis (13, Figure 9) backwards and downwards and thus interferes with the air-waves as they pass out of the larynx. Contraction of the genio-hyoid muscle which extends from the jaw to the hyoid bone (5, Figure 9) gives a peculiar muffled quality to the tone.

All of these extrinsic interfering muscles are attached directly or indirectly to the thyroid cartilages of the larynx. Their strong contraction has the effect of pulling the thyroid cartilage (e Figure 7) upwards and forwards away from the cricoid (a Figure 7). This has the effect of fixing the little arytenoid cartilage (b Figure 7) so firmly upon the cricoid, that the vocal muscle is unable to rotate it. Without the rotation of the arytenoid cartilage we lose the lessening of the length and weight of the vibrating cord as shown in Fugures 5 and 6. These two factors should give at least a change of two octaves in pitch. Interference of the extrinsic muscles, therefore, takes away the two most important factors in pitch-changes leaving us nothing but increased tension to depend upon. This means great tension on the cord and vocal muscles for the high tones, the use of comparatively large amount of breath to swing the tense cord, fewer segmentations of the cord and a cutting down of our material for changes of quality. We will appreciate this fact better when we realize that to raise the pitch an octave by increased tension alone we must quadruple the pulling force. Every voice should have a range of three octaves and this without effort. To get this by increased tension alone means for the highest pitch sixty-four times the initial pulling force. If all three pitch factors are present this range could be produced with probably less than four times the initial pulling force. We are now in a position to understand the relationships of these classes of facts. The conditions of the throat which gives full use of one class gives full use of all. If we would make use of all three factors involved in pitch-changes and avoid straining the vocal muscles, we must relax *all* of the extrinsic muscles. If we would get good intensity and carrying power with the use of little breath and without straining the vocal muscles we must relax *all* the extrinsic muscles. If we would produce tones of good quality, that is tones composed of a strong fundamental and at least seven overtones we must relax all of the extrinsic muscles. We may sum up the whole subject of voice production in the phrase "relaxation of the extrinsic muscles." A natural law is a formula which resumes or sums up in a few words a wide range of phenomena. Here then is the natural law of tone

production and the fifth and last step in the scientific method as outlined above.

The next question is why do singers and speakers interfere, or the etiology of interference. This is readily understood when we know the nature of the two sets of muscles concerned, viz: intrinsic and extrinsic. The intrinsic muscles are involuntary and not directly under the control of the will. Their action cannot be forced but must be induced. The extrinsic or interfering muscles are voluntary or directly controlled by the will. The universal tendency of the singer or speaker when they perform is *to do things* and thus bring the will into action and the resulting interference. The novice realizing that something is wrong goes to the teacher to have this corrected. The advice almost always given is to sing the tone some other way and thus confirm the interference. If this is kept up long enough the overworked vocal muscles give out and the voice so far as effective singing and speaking is concerned is ruined. What the teacher should do is to stop the pupil from doing the things which are wrong; and this brings us to the matter of diagnoisis of interference by listening to voices or voice auscultation.

In learning to diagnose diseases of the chest every medical student is required to familiarize himself first with the normal breath and heart sounds. Then his ear is gradually trained to recognize variations from these normal sounds due to the different diseased conditions. In no other way can he learn to diagnose correctly diseases of the chest. In precisely the same way must the teacher's ear be trained to recognize the changes in quality due to the different forms of interference. Except in the case of the soft palate interference there is no other way the teacher can detect it. Closing the nostrils with the thumb and finger is a simple and certain test of soft palate interference. If there is no interference most of the tone will be shut off at once. If there is soft palate interference there will be no change in volume or quality. However, a glance at Figures 9 and 10 indicates that it should be very easy to hear this interference without any nose pinching, and it is. The great disadvantage which the teacher of voice labors under in comparison with the medical student is that the normal voice-sounds are not heard. There is no standard of tone-production at present. Soft palate interference is universal even in our greatest singers and for this reason we do not yet realize what the capabilities of the vocal structures are. False cord interference makes a decided change in quality and is readily recognized by the trained ear.

Changes in quality due to the other forms of interference are not so marked but patient practice will enable any normal ear to detect these in time.

As to treatment, the only possible salvation for the singer or speaker is to learn to produce a tone without interference and then practice this tone until the whole range and volume are developed. Interference means the use of the extrinsic muscles and we cannot get rid of a bad habit by practicing it. The action of the intrinsic muscles must be made absolutely independent of the extrinsic.

As to a standard of criticism there is none at the present time. Voice analysis has shown that to produce a strong fundamental tone there must be complete relaxation of the extrinsic muscles. The more complete this is the stronger is the fundamental. The ear then should be trained to recognize the fundamental tone. A tuning fork and a properly tuned resonator produces only a fundamental tone. This will help to train the ear to recognize the strong fundamental tone in the complex sound we call the voice. Nothing, however, but voice analysis will train the ear to hear all kinds of interference and here is where we have had the advantage of all others in working out this most difficult problem. Without this we should have failed utterly not only in detecting interference, but in working out a rational method of eliminating it. The teacher should be a critic *par excellence*. The great teachers are the newspaper critics as they reach all the people. Each must learn to hear interference before he can become efficient in eliminating it. The ability to detect interference is the basis of true criticism and this must come through voice analysis.

221 West Thirty-third Street.

Sarcoma of the Tonsil. G. BERRY, *Boston Med. and Surg. Jour.*, March 7, 1912.

The author reports a case which is of interest because of the extreme age of the patient, 86 years. The acute throat symptoms demanded the removal of the tonsil tumor with resulting relief to the patient. The writer then reviews the literature dealing with sarcomata of this region, with particular reference to the surgical treatment of such conditions. BERRY (MOSHER.)

STANDARDIZATION OF VOCAL TRAINING FROM THE TEACHER'S STANDPOINT.*

MR. AND MRS. H. HOWARD BROWN, NEW YORK CITY.

Our work as teachers for the past twelve years has been with a view to assist in the important step of standardizing vocal training when the time should come. We believe that "standardization" will be brought about just as soon as the teachers, critics and laryngologists make up their minds that the many formulas which now exist must be superseded by a system of tone-production, based upon the scientific principle of cause and effect.

Why do we need a standard, why not go on as we have been doing? When the musical press constantly refers to the subject, and the National Association was founded for the very purpose of creating a standard, and doctors consider it of sufficient importance to make it a special feature of an annual meeting of the Triological Association, there must be a vital reason for all this talk about a universal system. Is the artistic conscience becoming super-sensitive so that it feels an unusual responsibility as a public servant? Is the public dissatisfied with its annual investment in singing lessons?

The study of singing constantly is increasing because the people are cultivating their esthetic tastes as a diversion from commercialism which has reached its heighth. Millions are spent every year for music and the people want a return for their money which they are not always sure of getting, owing to the lack of unity among teachers as to the correct method of voice-training.

Do not misunderstand us—individual teachers always have done fine work and both the empiricist and psychologist have got results, —and there has been some good scientific work. The latter branch, however, has been abused by pseudo-scientists who attempt to teach physiology without even understanding the principles of the subject.

The teacher of to-day is asking for social and professional position in the community. As Mr. Oscar Saenger, one of our most successful American teachers, said in a recent interview on the subject: "The vocal teacher is a tremendous educational factor in this country, not so much because of his work upon professionals, but on account of the large army of amateurs in whom he is developing the finer instincts."

*Read by invitation at the annual meeting of the American Laryngological, Rhinological and Otological Society, May 13, 1912.

Think of it, friends—having to plead for recognition of the profession which you have adopted for your life work. The teacher cannot, as a class, be placed upon a par with doctor, lawyer and academician until he secures public confidence by wiping out whatever abuses may have crept into his profession.

Just 300 years ago, the birth of opera created a demand for artistic singing, and in 100 years this demand was met by the creation of a standard which never has been improved upon, and the Melbas, Sembrichs and Carusos of our day are lineal descendants of Faustina, Farinell and their confreres.

This standard of production could not have existed without a corresponding grade of teaching, and vocal art had a secure foundation in the conscientious efforts of such great masters as Tosi Porpora and others. It would be easy to follow them if we were certain as to their methods, but in those days only the elect studied the art of singing, and a seventeenth or eighteenth century system is not equal to the strenuous demands of to-day, when everyone tries to learn. There was no laryngoscope then, and vocal physiology was not understood, but still empirical suggestion produced wonderful results.

Tosi tells us that in singing one must be free from facial contortions and that brings us to the point; he heard that such things made bad tones, but how did he remove them? It is for the teachers of today to experiment until they find out, and by the process of elimination and the study of vocal action to determine the principles of tone-production which underlie all esthetic efforts. In order to do this, a standard must be established and enforced. For the sake of argument, we are going to define a correct or "standard tone," as one in which there is full development and perfect harmony of its anatomical, physiological, psychological and pedagogical constituents.

Who have this tone? Melba, Caruso and a few of that kind. Standardization is not for them, but for the benefit of those who, through limitations, fall below that level. What shall we standardize? The anatomical cannot be changed, and the rules of interpretation are so well known that if one has the voice and can master the difficult problem of tone-production, he can find many instructors who can make a singer of him. If, however, the voice contains radical defects it is by no means certain that he will have them removed.

It is the pedagogical and physical which need standardizing and the former may have a complete vocal science at its command so

soon as the physical and psychological are placed in correct relation to each other.

The esthetic nature of the singer must cease to shrink from whatever of the mechanical is necessary before this can be accomplished.

All piano and violin teachers, nowadays, have methods for ridding pupils of stiff wrist muscles, but very few vocal teachers recognize and cure tongue stiffness as detrimental to good tone-production, although there are three unnatural uses of the tongue which affect tone-quality: The tongue grooved, or held too low in the mouth, creates a hollow, pinched and throaty sound. Thickened tongue, drawn back from the teeth, causes a thick and throaty sound. Tip of tongue tilted upward muffles the tone. Chin muscles, hardened, cause a hard, stiff tone. Stiffened jaw makes a tight, rigid sound. Stretched palate muscles make a hollow sound in the upper part of the tone. Relaxed palate muscles—a flabby tone. Weakening the down-holding larynx muscles and allowing it to fly upwards on high tones, produces shrillness and an uneven range. Larynx forced downwards causes a guttural, wooden tone. Sometimes over-contracting chin muscles pull the hyoid bone and thyroid cartilage apart, causing chronic hoarseness.

Any of the above conditions, when pronounced, tend towards vocal decadence, and if aggravated, they may lead to singing out of tune, nodules, hoarseness, or paralysis of the cords, should the respiratory tract become inflamed from any cause. They should be removed in incipiency by applying relaxation at the over-contracted points.

The singer's imagination and imitative faculty sometimes enables him to receive help from suggestions which are aimed solely at the effect, but principle says, "Treat the cause or your results will not be uniform."

It is not to be asserted that there have not been great singers whose voices contained some of the above defects, but it is certain that if their vocal action had been free, they would have achieved far greater results.

Bad breathing is at the root of most derangements and it must be remembered that the effortless breathing of daily use will not produce sufficient pressure for an artistic tone. The best method of breathing for singing and public speaking is a combination of costal and diaphragmatic. We reject the clavicular because it is a superfluous effort and creates stiffness. The ribs should be fully and flexibly expanded with the abdominal muscles relaxed during inhalation.

The latter and the lower back muscles are expiratory agents; therefore the method so much in vogue of pressing outward at the base of the breast-bone of inhalation, also, must be discarded, as this outward pressure starts a contraction of the abdominal muscles which interferes with rib expansion.

The approximation of the vocal cords is too well known to require description, but there is one striking fact about their action which must be borne in mind. They are assisted in phonation by certain sets of muscles, fastened outside the larynx. Any derangement of these extrinsic muscles acts directly upon the vocal cords, causing them to overwork and upsetting nature. The intrinsic muscles are incapable of any voluntary adjustment excepting approximation and separation, but all of the extrinsic muscles can be controlled, and it is through them that parts which are out of balance must be corrected. Cumbersome exercises must be avoided and the sense of artistic singing not only preserved but augmented by any gain in freedom of vocal action resulting from the correction of physical faults. Ordinary methods of vocalization may be used.

Have you heard the singer whose middle tones are good but who has a chronic tendency to a thin, screaming tone above "F," coupled with an inclination to sharp? He is violating the laws of fixation. An even scale demands that the larynx shall be fixed, not stiffly, but so that it does not fly up and down with ascending and descending scales. This fixation is the pivot upon which cord-stretching takes place. You all understand the lengthening and shortening of the cords for changing pitches. This is accomplished not alone by the approximating apparatus, but by an extrinsic mechanism which swings the thyroid cartilage forward: Larynx to palate, larynx to breast-bone, and thyroid to cricoid muscles.

From this brief sketch you can see that whether derangements are in the vocal action itself or in the interfering muscles outside of it, they act directly upon the cords and prevent artistic production.

Laryngologists find many cases that puzzle them in treating singers or speakers. They become aware of various kinds of vocal decadence without sufficient pathological conditions to warrant them; many of which seem to disappear under treatment and with rest, only to return in worse form with further voice use. These are just manifestations of conditions which we have described, and there is no question but that physicians would call upon voice spec-

ialists to stop them more often than they do if there were a reliable standard method.

The artistic gain from a standard system would be greater technic. The doctor who lacks this essential fails; the instrumentalist whose technic is faulty from bad tone-production is rejected. But what happens to the singer who fails to achieve fluency? He goes into opera, sings the loudest and highest tone possible, and receives the adoration of the public—or he joins the ranks of modern declaimers who believe that good singing consists solely in psychological expression. The ideal singer should have the whole combination of tone, technic and interpretation.

The physical is expression's tool, and with imperfect tools the greatest results never can be attained. Every method now in vogue has its peculiarities, but the new system would blend the good points of each and eliminate its bad ones. Nasality, thickness and registers, all could be equalized. The method consisting entirely of covered tones, the one which substitutes falsetto for mezza di voce, the use of tremolo, could be artistically adjusted by abandoning the formula.

It is true that resonance is felt more in the chest on low tones, in the pharynx and mouth on middle and in the nasal cavity on high ones, but the voice can be blended into an even range if the correct action, described herein is used on every note of the scale and the breath pressure and muscular tension allowed to change but infinitesimally on each ascending or descending pitch.

By the same means one may achieve mezza do voce, which is the whole voice used with less power than for loud tones. When a sudden change is made in going from loud to soft, instead of a very gradual one, falsetto results instead of mezza di voce.

Falsetto consists largely of the initial, or larynx tone and is therefore a distant relative of the real tone.

The whiteness of the open tone, with its "smile that won't come off"; the eternally pathetic sound of a covered tone; the lugubrious and heavy sound of manufactured contralto, caused by lowering the back of the tongue and stiffening the chin muscles, all can be normally adjusted by means of a standard system. Tremolo, one of the most serious faults, is the result either of weakness or forcing in the breathing apparatus, or in the mechanism itself. Its cure is to teach control at the affected point.

We make no distinction between the male and female voice in our methods of handling pupils, so far as tone-production is con-

cerned, but in the female voice the difficulty of making an even scale is more pronounced between the middle and lower registers, while in men it more often occurs between middle and higher.

As the principles of a standard system are alike applicable to the speaking-voice, a great and useful field of work might be opened in this department.

The principle of correcting false positions of the larynx and enunciating organs already is in use in speech-defect clinics, such as Dr. Makuen's, but a more general use of the standard system could be made, if vocal training by its principles were made part of all school teachers' normal curriculum.

If school children could be made to produce pleasing tones in a natural manner, to enunciate distinctly and pronounce correctly, perhaps some of the opprobrium now cast upon the strident "American voice" might be removed. As a matter of fact, our voices are as good as any others, and English is beautiful when properly delivered, but an admixture of races, together with American strenuosity, have made us careless in the matter of speech.

This conditions will be modified as people turn their attention to esthetics, and with a reliable system no doubt many business men would take voice-training just for the sake of speaking well. One might develop a good speaking-voice in a few months, whereas it takes several years to learn to sing well.

We have had these cases of corrective work: a lawyer who from sickness when a child, had thickened arytenoids and a spread thyroid cartilage, with a consequent falsetto voice; a business man who had relaxed vocal cords and blurred enunciation, from using a heavy whisper in dictating letters; a broker with chronic hoarseness from shouting on the stock exchange; an eminent priest, with vocal paralysis, from forcing his voice by over-contraction of chin muscles.

These people all made complete or partial recoveries, but with proper training in early life their troubles might have been averted.

A girl of 8, who refused to articulate, and who could not be understood, was made to speak distinctly in nine lessons; a young man of 24, speaking soprano from a larynx held too high, after one lesson, spoke in a good baritone. His sister, who from a relaxed palate, talked like one with a cleft palate, was cured in four lessons.

I have a class of small children for sight reading, all of whom were monotones, with the dead quality attendant upon lack of musical perception. In three months all but one could sing tunes, and constant suggestion has given them at least an acceptable tone-qual-

ity. A standard system, therefore, would be of as great benefit to speech as to song.

This is not a plea for the strictly physiological method, for singing cannot exist without the esthetic, and emotional expression is the thing most to be desired, but the point is that every teacher should understand the laws of vocal action, and by combining these with the esthetic, have a good psycho-mechanical system, by which individual requirements could be met. We should work upon principle, but each one may use his own application of exercises.

We have come here to offer some suggestions which we hope will concentrate thought and action into a practical move. Something must be done to meet the demand for a standard, and the wisest plan is to begin with concerted action which, in time, will develop into a consensus of opinion.

The word of the individual can be accepted only as it helps to balance the scales, for human nature is such that, if we had Porpora in our midst, he would have some disciples, but many dissenters.

The committee must not be large enough to be unwieldy,—if possible, a few teachers, doctors, critics, willing to give the necessary time to the work.

The keynote must be experimentation with voices. Two lines must be followed—normal voice-development and the classification and removal of all tonal peculiarities caused by interferences. Issue a call for singers who never have taken lessons to come before a committee for the good of the cause. By this, a few simple rules could be made and their underlying principles shown, the use of which would be of inestimable benefit.

The committee should report the proof of its results to the National and State Associations, and this would lead to the establishment of national and state normal schools, where teachers could study all branches of the art. Legislation would then be possible, for there would be something definite upon which to legislate. The period of study and quality of knowledge required could be fixed by law.

We are optimistic enough to believe that teachers would embrace the opportunity of acquiring a definite knowledge if it were properly presented. If they did not, they would risk failure from the loss of public support.

The benefits to teachers would be two-fold: first, the recognition due them; second, financial gain from increase of business by having secured public confidence.

Gentlemen, by going to your homes and agitating this important matter, you can be of great assistance in bringing it about, and we firmly believe that this meeting will prove to be a valuable contribution to better conditions, which are sure to result from the standardization of "Methods in Vocal Training."

We present for your consideration a clinical demonstration of four cases with a diagnosis of conditions, and a suggestion for remedy of defects.

Case 4: Soprano. Imperfect connection between breath and tone, causing poor attack. Breath-pressure not strong owing to chest falling too rapidly. Stiffness of neck, chest and tongue-muscles, causing a thickness of tone.

By removing stiffness of chest-muscles during inhalation, and not allowing upper chest to full too rapidly during the singing of tone, the singer was enabled to create a breath-pressure which allowed a relaxation of the stiffened neck and tongue-muscles, giving free emission of tone and making the quality clearer and lighter. The pathological history of this case showed that she had recurrent double nodules on the vocal cords, which had been removed by Dr. Frank E. Miller, allowing the voice to be used again.

Case 8: Contralto. Breath support and attack poor. Back tongue too low—lips, jaw and chin muscles stiff. Registers of different quality and not blended, vocalization on "oh" with covered tone. Enunciation impaired from lip; jaw and tongue stiffness. Relaxing this stiffness vocalizing on "ah" with better breath-pressure caused a better quality, tone becoming softer. Registers were somewhat evened by using same character of effort at different parts of the voice.

Case 15: Baritone. Great bodily stiffness and poor breath pressure, vocalization on "oh" and covered tone with forcing and roughness. Readjustment of body and relaxation of tongue and lips with vocalization on "ah" gave a better quality and smoother tone.

Case 14: Baritone. Man of 34, who had sung soprano in public until 29 years of age, when voice suddenly changed to baritone. Range limited, breath pressure poor, tongue grooved, causing pinched tone. Facial muscles over-contracted. Relaxing tongue and facial muscles and giving more breath-pressure gave a much better quality of tone and removed a roughness which had been present. Vocalization all done on "ah."

810 Carnegie Hall.

VOCAL ART SCIENCE FROM THE STANDPOINT OF USE AND ABUSE OF THE VOICE*

DR. FRANK E. MILLER, NEW YORK CITY.

Vocal Art Science, from the standpoint of use and abuse of the voice, is the subject presented to you to-day for your consideration and discussion. Definite and worthy results can be obtained only by sincere concentration of thought, combined with effort, and I will ask you to give your undivided attention to the first and foremost necessity resulting in our present urgent demand for a possible *American Standardization* of *Tone Production* in *Vocal Art Science*, and its subsequent issues.

I believe that in general laryngo-pharyngeal observations are so replete with inaccuracies and individualisms, so far as voice productions are concerned, that conclusions of general value cannot be determined. It seems necessary that individual cases should be set aside, to give room for thousands of observations on different schools and individuals in order to furnish solid facts on which all may stand and depend, and we believe it absolutely true and necessary that the physicians, physicists, singing teachers and performers, each one in his own sphere, and all collectively work in harmony for a common end and goal.

In 1891 I stated the necessity for a standard of tone, and had the idea of constructing a voice measure, a tester, a phonometer or vocometer, if you please. It was to consist of a combination of a phonograph, photograph, and a mechanical reproduction of the registration of the vocal sounds, the combination so arranged as to form a standard for vocal tones, to measure and compare for all time every voice in the world. After much deliberation and thorough discussion of the subject, one conclusion was irresistible, that for the present the only practical vocometer is the tried and experienced maestro, who, by his delicate and finely trained organ of hearing, power of judging expression, and aided by experience and ability to impart his knowledge, is able to conduct the pupil to use properly that divine gift, the voice, in a perfect manner, so that tone springs from the throat with a spontaneity, and coquettes with a reserve that makes us long for more.

*Read at the meeting of the American Laryngological, Rhinological and Otological Society, Philadelphia, May 13, 1912.

In a long career of practical specialized work, I have had the good fortune to closely observe some of the foremost singers of the day, and I have gathered a store of information as to what does, as well as what does not constitute good singing. I feel that I should give the results of these observations to the many earnest vocal students who are striving towards the light, in the hope of rendering practical service. There is no intention upon my part of serving up, as in compressed tablet form, a complete musical education within the limited time allotted me.

Vocal Art Science stands for the consummately true and beautiful in singing. The singer must weld the art and science into indissoluble union. He who does this practices the most exquisite and ennobling of arts, giving messages of inestimable uplift directly to the human soul: he is the true exponent of *vocal art science.*

In regard to the loss of voice in singers, Mr. W. J. Henderson has stated that two things—ignorance of any method of singing, and acquaintance with a radically incorrect method—are the most prolific causes of voice-failure among singers.

The important question for throat specialists, physicists, teachers and singers is :"How is tone produced by human vocal organs?" Up to the present time it has remained unanswered. I attribute this to the fact that the above-named professionals seldom work together. Each one makes researches in his own line, without regard to important factors found by the others.

In order to understand our subject we must have a correct *voice analysis.* Artistic singing involves complete physiological control of the voice-producing functions, combined with entire command of the metaphysical resources of art. In order to understand what is meant by "physiological control of the voice-producing functions," it is necessary for us to have a correct understanding of the *voice-producing mechanism,* and the *method of control.*

This essay is not intended to bring forth any new theories, but to state a few facts as they appear under careful observation, and to leave them with you. The most earnest work of the singer, the teacher, the physician and the physicist is necessary to bring some clearness out of a multitude of divergent opinions prevalent to-day on voice and voice-production.

It is proposed to mark the singer on the basis of 100 counts, and to give such points as range, and resonance, breath control, etc., their due value in the sum of the whole. Before presenting the scheme of marking, it will not be amiss to explain clearly what is understood by range, timber, volume, and other terms which slip

so glibly from the tongues of persons who have no clear idea of what they imply. Recently the author of a popular book made the statement that singing "off pitch" was the only fault existing in singers. When confronted with questions of a lack of resonance, breath control, tongue, position, and the like, he said that "pitch" included all these. What ailed this man was that he did not know the meaning of the term "pitch."

Style includes diction and expression—by it we approximate the singer's grasp of the aria or song and his ability to convey his conception to his audience. Good style implies a nice discrimination between text-production and voice-production. It means the proper idea of the relative value of vowels and consonants. It is through good style that we come closest to the mentality of the singer.

Resonance is the reinforcement of song by means of hollow spaces, which gives quality to vocal sounds by their reverberation. In singing we distinguish between nasal and palatal resonance. These should be balanced, and when we say the resonance is not well distributed we mean that one or the other is lacking or deficient in quantity. In speaking of nasal resonance, it is understood, as in all illustrations in this article, that there are other resonances, these two used as examples to illustrate the idea.

Range is the scope, extent or compass of the voice. Some voices are short, while others have a greater scope than is usual. Volume is the space that voice fills, or the encompassing power of the voice. By flexibility we mean elasticity, or pliancy. The flexible voice can execute rapid and difficult phrases with ease, while the stiff voice finds only the slower and heavier passages possible to it. The flexible voice swells and diminishes with ease, and gives the subtle accent and diminuendo to good style. Agility comprises the power to execute trills, flourishes and florid work generally. We understand by breath-control, breath so managed as to insure good phrasing and steady support to the tone. The abominable wavering and wobbling of tone which so often offends the ear is nearly always caused by defective breath-control.

When we make a special note of the tongue we are considering its position—for the tongue, of which the Holy Writ speaks as "an unruly member," must not be obstreperous; it may prove to be a serious obstacle to the attachment of the open throat and smoothly flowing tone.

The Germans call timber "tone color." Timber is individuality of the voice. No two of us have identical timber. We may speak of a voice of white timber, or quality, showing lack of nasal

resonance—dark timber, the result of a sort of faked weight and the besetting sin of contraltos; sympathetic, rich timber, etc.

To explain the chart (of which the following is submitted as a sample) each of the points—personality, experience, style, timber, volume, resonance,—ten counts each; range, tongue, flexibility, and agility,—five counts each; breath control and pitch,—ten counts each. "Voice" means kind of voice. We divide singers into three classes—first class, 90 counts or over,—second class, between 75 and 80,—third class, below 75 counts.

SAMPLE OF CHART FOR MARKING SINGERS.

NAME: Miss.....; Residence: New York.
NATIVITY: American. Weight: 178 lbs.
PERSONALITY: Stout, mature, self-possessed (5). Height: 5 ft. 8 in.
STYLE: Good (10). Type: Florid.
PROFESSIONAL EXPERIENCE: Has sung in 6 operas; coached in 9. (10) Complexion: Fair.
PROFESSIONAL SINGERS IN FAMILY: Class: 2—76 counts.
VOICE: Soprano. Range: A (flat) to 6^2 (10). Timber: White (5).
VOLUME: Fair (5). Resonance: Sings way back on vocal cords (5); no nasal; marked fundamental.
TONGUE: Humped (5). Breath Control: Good, big diaphragmatic development (10).
FLEXIBILITY: Ordinary (3). Agility: Lacking facility (3). Pitch: Sang habitually sharp—(5).
REMARKS: Has influential friends who have sent her abroad. $14,000 spent for instruction in four years. Trained with Herr F. E. and G. Q. Says she has good voice but her training has done more harm than good. Herr P. highly recommends her. G. says she will have a brilliant career. (Made upon person who marked, an unfavorable impression—quality over-rated).

Causes Influencing the Resonating Spaces: It will be impossible for me to go into the matter of interference in the hollow spaces from the turbinates, tonsils, etc., to a satisfactory extent; this matter has been taken up in detail in my lecture, which will in short time be presented to you for your consideration in my new book, *"Vocal Art Science."*

I will here merely suggest for your consideration that the causes influencing the resonance spaces are the three valves of our instruments, viz., the palate, tongue and epiglottis. The action of these determine the entire voice question, because they not only govern our resonating spaces, but control in a very elastic way, the action of our whole instrument. Most all medical questions center about these:

When the palate is removed, so as to make a perfect arch, as has been done in former years, without consideration of its effect upon the voice, we have the well known symptom of egophony, or bleating, and ability to form overtone is markedly diminished; yet even

with this an artist has been known to go through his whole career, but not without extreme mental suffering through his vocal exertions. I do not mean to even suggest how this body shall decide that operation, but we should consolidate upon one opinion as to where and how it should be ablated.

As within its folds and attachments we have the tonsils, another question comes forward: Normal tonsils assist the voice, acting principally to lubricate the adjoining muscles, by separating and moistening them, and also as a safety-valve for the excessive abnormal secretions developed by the digestive tract. In this way they modify and hold the balance of resonance of the three cavities just mentioned, and they are of most phonetic value when normal, to say nothing of their value to digestion.

Diseased and enlarged tonsils interfere with all the muscles in their vicinity by infecting them, and distorting the vibrations of the voice and impairing the functions of the three cavaties mentioned above, besides destroying the valuable assistance of sunesthesia, or co-operation of all the senses.

If they can be restored to normal by any means otherwise than by removal, it might be tried, but we must bear in mind that voice is a habit, and if the habit is bad, it were better to remove the tonsil. Diseased tonsils from the atrophic side are more to be feared, because they harbor pathologic germs, which result in specific infections. Among the results of these infections we have the node, which in turn will be influenced by the special poisoning that infects the tonsil, diptheria, mixed infection, staphylococcus, and pneumococci, which cause catarrhal conditions of the pillars and the plica. In order to have a most interesting session, a number of cases were brought from New York for the opinion of the Fellows gathered from the four quarters of the United States. Some of these cases are as follows:

Case 1: A fibroma developed upon the center of the vocal cord, as a sequel to a node, i. e., a small red tumor hanging from center of left vocal cord. This took two years to develop. It can be demonstrated by a mirror, or by the singing voice, and is best observed while singing the scale of *F* at both ends of the scale. It was to be left to the judgment of the Committee of the Society as to what should be done in this case.

Case *18*: Fibroma on the right vocal cord, same as case No. 1, but the fibroma had been removed one week before the meeting of the American Laryngological, Rhinological and Otological Society, and the patient was capable of being demonstrated. Patient

sang full range in one week after removal of fibroma. Query: When, in the judgment of this august body, should he be allowed to sing?

Case 2: Fibrous band tissue was developed, about the size of an apple seed, on the arytenoid end of the left vocal cord: one and a half years' duration. After several consultations it was deemed best to remove it. Upon removal in three weeks patient was able to use his voice from C^1 down to A, without any noticeable impairment. From A, below, a husky sound developed in the voice. Query: What should his exercises be, and when might he hope for a full return of his voice? (Most people understand this trouble as "false cord interference," as is produced by pronouncing the word "luck" very forcibly, and lingering on the letter "k," used by many teachers to illustrate attack and breath control.)

Case 3: Left frontal sinus and left antrum trouble, with hypertrophied turbinated bones. Removal of the turbinated bones—in three months resulting in marked diminution of all discharges. Three days after removal the whole left side, face and vocal cords became partially paralyzed. Vocal cords, true and false, became thoroughly relaxed. In three months time they were restored to normal. Query: What caused the partially paralyzed condition of the vocal apparatus in the larynx? The close association of turbinated bones with the nerve supply, or Meckel's ganglion, would account for the facial condition. This has occurred several times in my practice, and would seem to indicate that the akinesis, or relaxation of the vocal cords on the left side of the larynx started in the temporary injury to Meckel's ganglion above, although the nerve supply of the larynx is quite remote.

Query 2: What influence does the removal of the turbinated bones on one side have? If Muckey and Hallock's theory be true, that the closing of the post-nasal space by the soft palate, causes a disappearance of the four upper overtones of the voice, are not these three turbinated bones the resonators which respond as partial overtones to the fundamental of the vocal cords,—B^3 flat, G^3 and E^3—the superior turbinated bone representing B^3 flat, middle turbinated bone representing G^3, and the inferior turbinated bone representing E^3? However, having left three whole turbinated bones as resonators on the right side, and having perfect space to breathe through on the left side, with undisturbed septum, in this case, has given the patient perfect voice. The voice improved markedly in its overtones, and opened, as the patient said, "a new resonance cavity," giving him an entirely new placement for tone.

Query: When, how, and where should the turbinated tissues be removed in singers?

Case 4: In February, 1907, removed double C-sharp node with forceps. Sang in three weeks. December, 1909, removed one node from left cord—a double C-sharp node, that is, nodes at anterior third of cord. Recovered in three months. December, 1910, removed three nodes, two C-sharp and one F-sharp, or nodes occuring midway between the anterior third and the thyroid end of the cord. The F-sharp node was found on the left vocal cord, leaving the cords in a ragged and apparently torn state. After removal in 1910 the return of the voice was exceedingly slow, and at the end of six months two enlarged and atrophied faucial tonsils, and also a lingual tonsil, were removed, the removal of which (though not very large) was deemed best, when it was recalled that our beloved and esteemed Dr. Knight wrote an article on this subject, suggesting this procedure. Patient did not speak for six months and did not sing for nine months. Has now been singing for two years in a perfectly reliable manner, probably due to the fact that after the nodes were taken out both faucial and lingual tonsils were removed. However, I leave that for the Society to decide. Much interest was centered about this case, because of the Curtis method of reducing nodes by singing arpeggios, scales and notes, focussing in the mask, and pronouncing *"maw-maw-maw"* with chin resting on the sternum; or the Howard Brown method, which is singing the thirds, arpeggios, on the syllables, *"ha-ha-hay-he"* with *ha-ha* on the same note, *hay* made nasal on the third above, and *he* returning to the same note as *ha* below. This produces an elevation of the edges of the cord with a new form of alignment, which in turn is due to the change of the arytenoid in its position in the facet of the cricoid-cartilage, which does away with the falsetto notes used in the Curtis production, since segmentation only occurs above C, the production of which gives the first division of cord for the formation of overtone, no division being perceived in the first octave of the C upward; the Curtis method being sung in falsetto tone above this C, and being focussed in the mask, with notes carried upward in pitch, it would seem not to be practical for the removal of nodes which have an affinity for the anterior third of the cord, as seen in all cases of the C-sharp node, or the common node of singers.

Nodes follow the laws of segmentation. If falsetto is sung it involves only the portion of the cord in vibration above the first octave; manifestly as the swing of the other notes goes below the

cord, there is now vibration in them. Again, in singing the falsetto tone on maw-maw-maw, the pitch is taken in the vicinity of E and F and cannot be carried down farther than C without breaking of the voice, as a rule, but with practice it can be done. Now as we can generally sing from C to the C above without any difficulty, it is not necessary to sing falsetto at all, unless we get into a bad habit, which the word "falsetto" indicates. True, we know that if one looks through the anterior nares of a person who has a very large and long patent choana he will observe that for every change of pitch there is a very limpid and accurate adjustment of the soft palate. It will be seen to fly up and hold its position for a moment, with every suggestion of the pitch-producing apparatus, in a manner bordering on the marvelous. It resembles a column of water thrown to a certain height, alternately rising and receding in perfect rhythm. Hence we know that the palate is arranging the post-nasal cavity for the production of an overtone and pitch, and the necessary resonance of tone-production, for then there is a reflection from the post-nasal cavity and that is reflected upon the vocal cords at the point of segmentation. Will not any singing, correct or incorrect, cause nodal formation? Or does the production of a false tone cause inharmonic conditions which rearrange the nodal formation on the cord in a different manner, so that an attempt might be made to change the position of these nodes and in this way help eradicate our difficulty. The scheme of the Browns, of the "ha-ha-hay-he" through the nose, involves both the use of the fundamental note of the cord and the segmentation system above the point where the fundamental begins to be reinforced by the superstructual tone—because with the aspirant "ha-ha" they bring the cords slowly together for the sake of massage, and with the "hay" through the nose they get the massage and reflex activity of the space which is used for overtone formation, also a positive and different alignment by the action of the palato-pharyngeus in cord-stretching.

Or shall we employ another method by applying an astringent, such as adrenalin, cocain, zinc, tannin and argyrol, thus absorbing the small infiltration into these tissues?—all of which have been known to apparently absorb fresh nodal appearances on the cord. All of these methods have been observed by many men, and have been successful to a certain extent, but one thing is very positive, when acute inflammations exist, combined with infections, colds and the like, the voice can not be used without great danger to the vocal cords. When a node begins to be organized, as indicated by its

size and redness, it practically becomes necessary that the patient must have absolute rest. A fibroma is decidedly different tissue from fibrinous development in node formation; so is papilloma. Our energetic Secretary, Dr. Harris, in writing to me on the question of etiology of node formation, said he did not believe that I could prove successfully before a jury of our Fellow Laryngologists that cheesy degeneration of the tonsil caused nodes. I have never been able to prove, by reading my articles, that I made such a statement, nor wish to have such an idea hold sway, although I have never seen a node form without at some time in its formation cheesy deposits were expressed from the tonsil.

The patient had no other sensation than that of a weakness of the left side of the throat in the vicinity of the vocal cords, with a tendency to clear (as it were) and a sensation of mucus in the throat, "but no mucus would come." Examination revealed (as illustrated in one of the oil paintings brought with me) white cheesy deposit in the atrophied tonsil, several thickened papules lying on the surface of the mucous membrane of the anterior pillar, or palato-glossus; some of the circumvallate papillae are thickened and red; several papules appear upon the mucous membrane over the palato-pharyngeal fold, and several (generally one) upon the mucous membrane over the ary-epiglottic fold, or ligament. In this condition when the secretions cease, and these papules become irritated through lack of moisture, a sudden tickling sensation ensues,—the palato-pharyngeus contracts in an irregular manner, acting upon that part of the palato-pharyngeus which regulates the part of the palate which is concerned in the formation of the superstructural or partial overtones. A sudden spasm ensues, and relaxation occurs in the whole of that side of the voice apparatus, the larynx presenting an akinesis, or sub-luxation of all the parts, entering into the formation of the glottis, especially on the side affected. In experimentation several years ago, by tying off the middle fasciculus of the thyroid-arytenoid-externis, it was seen to cause the middle third of the cord to bulge. This occurs not at once, but after several spasmodic efforts, especially with the clearing of the voice. At first it resembles an outward curved condition of both true and false cords, and in a short time it is seen that this part bulged, also that all the intrinsic muscles are in a state of akinesis. When the action of phonation ensues, the cord of the opposite side will be observed to exhibit the following characteristics:

As if to protect its injured fellow, the arytenoid will be drawn in front of the injured one, and the cord at its arytenoid end seems almost to cross over and above that of the injured cord. Strange to say, the node more often appears on the well side than upon the weakened side; thus the cause of the fibrinous deposit toward the arytenoid end could possibly have been accounted for in this way, and in one of the illustrations from the twelve records which I have had prepared will be heard this peculiarity—in a few seconds of a Victor record which I have copied for this occasion, as well as a few seconds of another record wherein the patient had been singing for two years with a papilloma the size of a pea existing between his true and false cords. This artist has not lost a single performance, and when I saw him on March 24, 1912, for the last time, every vestige of this papilloma had been absorbed, without taking one drop of medicine, the artist himself preferring to go on in his anxious condition with much more care than in former years, satisfied with the constant encouragement of an ever decreasing tumor. Such are vagaries of vocal troubles! His own expression was: "I formerly abused my voice, but now I use it with care." I believe that with this principle in vogue, there will come a time when the examining laryngologist will say that "he never had a tumor!"

While we are on this question, I will ask you to look at some of the effects of the voice upon modern instrumentation: Yonder is a piano, and the first thing that commands your attention is a "V" which resemble a pair of inverted vocal cords. This indicates that this piano is constructed with its break between E and F, or at the crucial points of the singing voice. F is the note of cosmos, of all the great natural things,—the humming of bees,—the roar of the mighty Niagara. Why? Because God attuned these great natural things to respond to the vibration of this note. And now be have discovered that C is the note of man. Why? Because the voice of man responds to that note in such a manner as it responds to no other vibration. Upon what foundation do I base this assertion? Through the poverty of instrumentation, having no mechanical resonators at hand, and endeavored to solve the problem of a standard pitch for the production of tone by the human voice, my assistant, Dr. Perrault, while playfully twirling a tuning fork, placed it in front of his mouth. I seized the instrument and repeated the effort, with the discovery that the human mouth will give the same result as the brass resonator, but in a more beautiful form, and in experimentation with over a hundred different pa-

tients the conclusion was forced upon me that the human voice will respond to the natural key of C as it will to no other note. In a male voice C-512 gives the desired result, and in the female C-1024. Different forks were found to respond more readily to different voices, but "C" responds to all.

Then, why not take the key of C as our standard pitch for tone-production? For the sake of harmony and unison in orchestration, the key of A was selected as the desired universal pitch by which to tune their many and widely differing instruments. Just as necessity demands a standardization for the mechanical production of tone, a correct attainment of voice production can be achieved by just such a standardization. This fact merely establishes a law which, though ignorant of the basic principle, has been adopted by the musical world even from the early ages.

The natural scale of C, without sharps or flats—the most difficult of all—should be our standard, for in it lies every difficulty for vocal art science to overcome. In this scale lies the two breaks the same as in the human voice. In playing the scale of C on the piano, after playing the first three notes, you place your thumb ready to apply to the fourth, and in ascending the scale from the fourth note, you again prepare to apply your thumb to the eighth note, thus giving you two breaks in the registration of the notes by the hand. In the majority of voices, male or female, high or low, you will find that there is a necessity to make a great change in voice production at these points, yet this must be done in the same position so as not to change the quality. It marks distinctively the closing of the soft palate against the post-pharyngeal wall. We notice at this point that the posterior fasciculus of the palato-pharyngeus glides up under the palate and becomes associated with the tensor palati and the levator palati, one of which stretches the palate and the other raises the curtain in such a manner that the air can positively pass under the soft palate, and on either side of the soft palate, which, with the levator palati, has bunched up against the posterior wall, so that an air space exists on either side of the raphe which regulates nasal resonance, or produces nasality, as required, and the tensor palati arranges this space in a most accurate manner for the overtones which are formed above this point,—namely: octave, fifth, octave, third, fifth, seventh, octave. This leaves four overtones to be governed by the rearrangement of the post-pharyngeal space by the palato pharyngeus, the tensor palati and the levator palati.

In May, 1912, we tested the voice of Miss Lillian Kiel, soprano, and found a most peculiar condition present. Although the young lady possessed a cleft palate of large proportion, she was able to sing a tone of very good quality in the middle range. The higher notes were present, but there was a tendency at F for falsetto to intervene in place of the natural tone. It was found that the tongue was held too low for perfect freedom of tone-production and that there was some stiffening of the chin muscles. Breath pressure was inadequate. The supposition in a case of this kind would be that the voice must contain nasality, but this was not the case, due to a natural musical sense causing the throat to form a combination which simulated the artistic tone. It was noticed upon looking into the throat that there was a contraction of the palato-pharyngeus muscles which play such an important part in adjusting the buccal cavity to the requirements of good tone. This evidently prevented the nasal sound, peculiar to cleft palate, in the middle tones, but was not strong enough to prevent falsetto on the higher tones. On being told her condition she began to try to sing the same quality of tone throughout her range, and in doing so she brought the tensor palati and the levator palati into action with the pharyngeus, thus distributing the balance better and causing a freer emission of tone and a natural quality throughout the whole range. The young lady herself was able to feel the new action which was present in her tone and it could be seen with the eye. The quality of tone became smoother, more resonant, and greater in volume, and without any break at F, tones could be produced as high as D natural, either forte or piano. The best result was obtained upon the descending tonic arpeggios. There is no question but that in time vocalization of this voice will produce control. It was tried to produce the same quality in the speaking voice as in the singing voice, and when this was done there was an instantaneous gain in distinctness of enunciation and the nasal quality present in the speaking voice almost disappeared. Laryngoscopic observations showed practically no variation in cord alignment between the falsetto and the natural tone, but the action of the palatal muscles was stronger in the latter than in the former, owing to lack of obstruction from the roof of the mouth the ends of these muscles were exposed to view and the following is an eye-picture of the throat singing *ah* on soprano F^2: Approximation of vocal cords. Arytenoids pull upwards and backwards. Stylo-pharyngei pull upward, outward and backward on the horns of the thyroid cartilage, throwing the larynx backward to the spine, assisting application

of tone. Pillars of the palato-pharyngei approach each other in the back of the mouth on contraction and pull upward and forward on the horns of the thyroid cartilage. Levator palati pulls straight upward. Tensor palati pull in a straight line outward toward hamular hooks to give a balance between palato and levator. Constrictors contract toward a median horizontal line across them. The stylo-pharyngeus is a muscle of fixation, but the rest of these muscles aid in cord stretching by pulling upward on the back of the thyroid cartilage and aiding the crico-thyroid muscle which pulls the thyroid cartilage forward in cord stretching. The tongue lies in such a position that unless voluntarily pulled downward the above things cannot be seen. On an ascending scale the tongue rises evenly throughout its surface to aid the hyo-glossi to pull upward on the hyoid bone and also aid the tilting of the thyroid cartilage.

The concerted action of the palate muscles and stylo-pharyngei contributes largely to artistic quality, seemingly furnishing just the right position to produce that peculiar ring in the tone which is necessary. In addition to their physiological action in cord-stretching they give the proper size and shape to that part of the cavity which they bound; thus materially adding to resonance.

Just as these muscles have a typical natural quality in tone-production, upon derangement they produce false sounds easily detected by the ear. If the levator or tensor palati become relaxed the tone will have a relaxed sound. Should the palato-pharyngei become relaxed or stretched the top of the tone will seem to have a hollow sound. There are three false qualities caused by bad tongue action: (Hollow tone—caused by grooved or lowered tongue; thick tone—caused by tip of tongue being drawn back and thickened; muffled tone—caused by tilting tongue upward). These false tongue positions usually derange palate action and they in turn upset the vocal cords, causing all kinds of trouble.

In using the tuning fork a most remarkable thing occurred in three different cases in which caries and necrosis of the bone was detected by means of the tuning fork applied to the teeth. In all of these cases it occurred in the region of the anterior ethmoid cells at the junction of the frontal and superior maxillary bones in the orbit, and acute pain was evinced at the moment the vibrating fork was applied to the teeth and the diseased parts could be absolutely detected by the area affected, and subsequently in all of these cases has been found necrosis of that part, proving that it was one of the first diagnostic signs of bone disease. The probable ex-

planation is that the fragments of dead bone vibrated against the acutely inflamed tissue at that point.

Four weeks ago I journeyed to Boston to meet that remarkable man, Dr. Edgar Holmes, who has done so much with the nasal endoscope, to observe these facts which I had previously observed with his instrument, but not as clearly as I have been able to see and demonstrate the wonderful limpid and rhythmic movements of the palato-pharyngeus through a patent nose, without the endoscope, while singing the vowel E, movements which definitely change with every change of pitch. I have not yet been able to see what was the action of the vocal cords through the nose. I had used Hay's endoscope with remarkable success in looking above, but not being able to tell much by mouth examinations on account of disturbance of the parts by vowel sounds and articulate efforts,—so I appealed to him. He gave me to understand that careful and correct examination could not be made through the nose. Careful and correct examinations can not be made through the mouth, I find however, so well as they can be made with the celebrated laryngoscopic mirror of Garcia.

Again to the piano: We see that it has three breaks, or registers —the same as the human voice. We also observe that the long eight foot 6 string regulates and governs the temperment of the piano. Every tuner knows this. The great problem is: how to there is a string about one-half its size, but another string is wound divide 13 by 12,—that is to temper the scale of 13 notes into 12 so that the steps between them are equal in relative pitch, and to make all these notes arrange themselves perfectly as they go from one to another. This Dillingham piano is the first harmonic scale piano made in the world on this principle. You will observe next to the C string that I have spoken of, which is eight feet long, that around it, about one-half its length, which makes it equal in weight to the long eight foot C string. This is done to have a properly regulated scale, also so that the eight foot string may be a convenient length for a piano, otherwise, when you are half-way down the scale, it would be manifestly a very awkward piano when you have finished several octaves below the eight foot C string that the piano requires. It would be necessary to have a string sixteen feet long, and to get the effects that the ear would be able to appreciate, you would have to have a sounding board that would occupy the length of a room; hence the eight foot C string seems to be the most reasonable and practicable. The winding of this increases the weight of the string and makes the pitch correspond, and makes

it possible to begin with a length, so that when you have finished the construction of the piano it will be no longer than the C eight foot string required. Now how are these two strings, so wonderfully different in construction, arranged so that the quality is not changed by the manner of arrangement and the manner of being struck? I have explained to you the arrangement. The hammer, you will see, is placed at different angles of the string, at different points for the new arrangement than it was for the eight foot tone. Now this is quite analagous to the voice. The palato-pharyngeus is the longest string, or longest muscle that we have in the human mechanism. It is concerned with the three constrictors, wherein we have the two breaks, as arranged in the piano. It is connected with the pitch of the voice, just as the eight foot C string regulates the pitch of the piano. It has many arrangements, same as the string which is eight foot long and the string which is not half as long, with its weight increased by wrapping the extra string around. It is automatic and has to endure a certain tension, the same as the eight foot string does, and it has to arrange the whole singing apparatus, to-wit: Suppose you have a case of cleft palate, as in case No. 10, the upper portion of the palato-pharyngeus hangs in a thickened mass, in an entirely different arrangement, along the sides of the pharynx. What occurs to the piano if anything happens to the eight foot C string? The whole piano loses its regulation? What happens to the human voice in the case of the cleft palate? The fineness of overtones and partials, and the whole feature of articulation is changed. Even the obturator, or plate, would not overcome this,—the even timber and position is changed, —yet in how great and wonderful a manner it helps to regulate the action of the stylo-pharyngeus, and maintains the pitch mechanism. Such do I believe is the function of the palato-pharyngeus. Yet it is perfectly evident from the study of this palato-pharyngeus that it is a striped muscle, and governed by the will. The reason that a node is formed is that this muscle gives way in its autonomy. Along this same argument, let us take the crico-thyroid muscle. This, which according to the best authorities is absolutely a striped muscle and voluntary, is supposed to work in harmony with the other intrinsic muscles of the larynx. On the theory that the pitch mechanism is voluntary, it would seem that the internal muscles of the larynx are involuntary, both in structure and by nerve arrangement. The crico-thyroid is said to act in harmony with the intrinsic muscles. It is one of the principal cord-stretching agents, and never changes in its actions in the larynx, yet autonomy com-

pels it to act with the intrinsic muscles of the vocal cords, which are all unstriped fiber, and involuntary, showing that by innervation at least we have an opposition to the argument of involuntary action. I am therefore compelled to assume for the sake of simple comparisons of voice subjects, from the study of the palato-pharyngeus and the crico-thyroid muscle, that the only way to look practically at the voice question is to study it from the standpoint of autonomies, which are controlled by the medulla of the spinal column, as well as in the brain.

Why not take the first of the great autonomies, beginning within from above—the naso-palatal—for instance: There seem to be autonomies governed by the valve-like sphincter, or fan-like muscle, such as the nostrils, the slightest compression of which will alter the quality of our tone. This cavity is closed off by another fan-like or sphincter-like muscle, the palate. The study of one portion of this muscular development which I have just shown you determines just how they should act to produce the partial overtones governing the quality and timber of the voice.

The second great autonomy is the oral cavity, governed by the three great valvular, fan-like or sphincter muscles, the lips, tongue, soft palate and epiglottis. From the wonderful chart "Consonants," which is painted by H. W. Merton, one can work out a very correct action of the tongue, for you see the action of every vowel and consonant by applying the tongue as suggested on the chart, and in so doing you can obtain as perfect a result as the instrument is capable of producing.

The third great autonomy exists between the palate, base of tongue, epiglottis, and the vocal cords,—or glottis. This may be styled the "momentic cavity." Here a wonderful mechanism exists in all the valves surrounding this cavity, and as I have said before, every valve portrays its action on the vocal cords, and produces that wonderful phenomena of voice-production, and also the formation of segmentation of the cords, which is revealed synchronously in the action of each upon the vocal cords.

Another and fourth great autonomy is the space between the vocal cords and the diaphragm, another great fan-like muscle. It regulates and controls in the same wonderful automatic way, and can be governed in the same automatic way as above, and as above we can see by certain macroscopic lines that it is not necessary to go into the individual muscular action or innervation.

The same principles as apply to the fourth autonomy apply to the fifth, or the space between the diaphragm and sphincter ani;

and the foundational power of all between the diaphragm and the sphincter ani will require but a slight study of all these various automatic arrangements to determine exactly how the human voice should act under its forces, just what the care of each should be, and just what abuse they will tolerate, instead of the present arrangement which will require the memory of 78,000,000 muscular actions or 15,000,000,000 nerve impetuses for one "ah" of tone.

Case 5: Trouble began six years ago; all turbinated bones removed in England four years ago; has suffered ever since with catarrh from dust exposure and cold, in fact, all through his life he has had one round of colds after another; left tonsil atrophied, and filled with cheesy deposit; left vocal cord and side of larynx in a state of akinesis. QUERY: Shall the left tonsil be removed? Whole larynx has turned more to the left side owing to the contraction which has taken place from the palato-pharyngeus.

Case 6: Exquisite high voice formerly reached C^2. At 18, had both tonsils removed, largest ever seen; weight, 175 grains. Is now singing in Philadelphia; at present singing songs every night, reaching high C, and now at the age of 23 sings high E^2 at all times and sometimes high F.

Case 7: Very careful, persistent singer. Sings solos in one of the New York churches. Had submucous resection, removal of two middle turbinated bones, and tonsils removed. Had constant break in voice between C and F. Voice at present very even and sonorous, with increase in range and ease of production.

Case 8: Removal of right middle turbinated bones for right antrum and right frontal sinus trouble. Has very small pharynx, and large larynx, with an epiglottis which clamps down the tone-production, leaving a small circular hole resembling half a washer. The result is—although one can see from her understanding of music, when she sings, that the mental attempt is correct—the instrument refuses to respond to the impulse: She has a voice that promises much, but does little, and is very limited. Voice in lower part resembles Schumann-Heink's—as can be seen in a few seconds of a Victor record, an excerpt from Schumann-Heink's "Mei und my Boy." The upper voice resembles Madame Guisippina Huguet's, as can be seen from a record prepared for this occasion, but never used.

Case 9: Used as illustration by Mr. and Mrs. Howard Brown. American, stout, mature, self-possessed, good style. Has sung solo bass in four of the principal churches of New York. Always sang from boyhood. Father and brother Episcopal ministers. Bass

voice. New York Yacht Club address. Weight 192 pounds, 6 feet in height, florid complexion. Class 90, first class bass for concert, church, and oratorios. Range C, below, to G. Volume rich, full, carrying power splendid. Tongue normal action, and regular in shape and action. Flexibility and agility fair, resonance irregular, breath control good, but not always sustained. Pitch correct. Timber heavy. Studied with Webb Chester Allen, Miss Hattie Clapper and Charles Hawley. Close affiliation with Mendelssohn Glee Club.

Diagnosis: Epithelioma of tongue, occupying right side and right border and middle of tongue. Operation November 20, 1911, five-sixths of tongue removed, leaving greater part of stump on left side. Operation performed by Dr. Frank Hartley, New York Hospital. Cases have been heard of, of mutilated tongue, who spoke well, but none where tongue was cut out entirely, or the equivalent (approximately) of the condition. To test his condition patient was requested to sing arpeggios on all vowels from C to E, also scales, also to recite the alphabet, while comparing the procedure with Merton's accurate and complete chart in oil (See Figure 4). His speech for the first three weeks was unintelligible. *"Ah"* made with the only portion of the tongue left, was all that could be desired; "oo" was fair, but *"E"* was impossible. The removed tongue seemed to have created havoc in his speech and automatism that was well nigh impossible to be understood. Now, six months later, by a constant course of reading, repetition of vowels and the alphabet, his voice is good, and his articulation fair. At my suggestion, Dr. V. E. Mitchell made a movable tongue, fastened by a pivot and slide catch attachment to the lower molars that gave a tilting and upward thrust of about ½-inch, which gave a much better *E* and *Ah*, and also helped materially in the formation of consonants and in eating, but which became irksome to the patient. It is marked exhibit No. 16. A remarkable rearrangement of the floor of the mouth occurred, in that the four layers of chin muscles have advanced upward almost flush with the teeth, the palate is relaxed, with smaller arch, sinks lower, and seems to have come forward

Case 10: Cleft Palate, referred to in Case No. 4.

Case 11: Able to sing one week after tonsillectomy, and will continue to sing. Great artist, and very beautiful voice.

Case 12: Removal of turbinated bones of one side, with opening into the sphenoidal sinus, which upon opening allowed her to have five or six extra notes, and increased nasal resonance.

Case 13: Young man, 13 years of age, voice not yet changed, just about to change. Beautiful charming voice. Tonsil and adenoids taken out two years ago has not caused his voice to change a bit. It retains its beautiful quality. Is capable of singing any mezzo soprano aria written.

Case 14: Young man sang high soprano, C^2, with ease. Sang ballads, oratorios and opera selection. Sang in vaudeville and has been recognized as a first class singer, capable of earning $200 per week. High soprano with woman's quality; voice in constant use up to twenty-ninth year. Had a rather small nose, small features, retreating chin. About 6 feet tall. When he was five years old, entering into a melee with the boys, was kicked in the spine just above the coccyx. The result was that he was very ill and could not walk; suffered great pain along the spine in back of neck for several months. It was noticed at this time that there was a marked arrest of the genitals; this remained until he was 29 years of age, when he married. From December to August his features began to change, and now he has a well formed nose. The turbinates, which were crowded, have lengthened out, and his nose on the inside seems to be quite normal. His epiglottis, which was very small, has grown rapidly, and is now a normal size. A large blue-black vein extends from the top of the epiglottis to the epiglottic fold. The tonsils are very much larger, though far from normal, yet well formed and regular. The voice has changed from a high soprano to a full-fledged low voice, baritone quality. Nothing abnormal is seen in this man, and nothing abnormal in his family. The condition is probably due to the arrest of the genitals, and possibly also of the pituitary body. This whole thing reminds me of the condition which I am accustomed to take very strict notice of in children between the ages of 12 and 14 when co-incident with the establishment of menstruation and the sexual function, the nose, especially the nasal bone and the vomer, and those in front of the pituitary body, seem to take on a special growth, during which time I advise against operations which affect those parts just referred to, as likely to arrest development of the same. At the bridge of the nose the greatest macroscopical change is noticed.

Case 15: Has baritone voice with range from F to F, two octaves. Produces big tone. Studied in Milan, Italy. Very fond of dramatic singing. Lacking in nasal resonance. Good breath control. The pitch is fair. Complains of general heaviness, and general lassitude; right undescended testes, with distended vescicles; large lingual tonsils and faucials, in which there are cheesy deposits.

Query: What effect would vesciculotomy and resection of the testes have on the voice?

Vocal art science abounds in abnormal conditions and in the study of these rare cases we must, from the very paucity of material for observation, be considered as mere students of singing.

Physiology is equally precise, and psychology is beyond the border line of vibrating influence of the other two, and is based upon the interpretation of the mental attitude. Pedagogy permits of the expression of all three, with due reference to both mechanical and psychological. It remains, therefore, for the four to come together and re-arrange out of this mass of facts and theories something which is equally tangible to all. For it is plainly evident that not one can stand alone. How shall we inaugurate such a movement? By the actual meeting of the four parties concerned, with living examples, each giving his findings in his own terms, and then providing expression to cover the requirements for correctness for every phase of vocal art science, to-wit:

I now present to you Mr. Munter and Miss Graham. Miss Graham has never taken a lesson, but has attended both concert and opera as an auditor. Nothing is known of the range of her voice; she has absolutely no knowledge of music, nor does she possess any musicianship. I will now take a disc from the phonograph, which Mr. Munter knows very well, but of which Miss Graham has no knowledge. Assuming that he be endowed with all requisites for the correct *vocal art science* demonstration, he will show you how easily he can by his psychic method produce a Melba, with due allowance for psychic disassociation and limitation.

Miss Graham called at my office February 26, 1912, suffering from an enlarged gland at the angle of the right jaw, result of a follicular tonsilitis.

Before coming into the office had heard a singer tried out with F scale. In course of the consultation she remarked that the one wish of her life was that she might sing like an operatic artist. Her voice was tried in the usual manner, with a very low marking, to which she replied,—"I don't see why I cannot sing like the great artists." The answer given was elusive and to the effect that she should be hypnotized like Trilby. To my surprise she told me that her employer had often hypnotized her to stop her headaches. The idea suggested itself that he hypnotize her to sing with a Victor as a medium of communication of the vocal song from his mind to hers.

March 2: Patient returns with gland much more swollen and tonsil again full of cheesy deposits. The advice given was to allow the gland to suppurate and when a little more pointed to make a very small incision in order to avoid scarring the neck. During this visit the patient informed me that her employer had hypnotized her as I had suggested before, and that he said she sang wonderfully well, but she could not realize it.

March 3, 10, 13, 17, 24, I was invited to witness the hypnotization. March 3, met at the house of Mr. Munter, who hypnotized her by direct methods, using only eye mastery and occasional brow stroke, both sitting in upright chairs for twenty minutes, until the patient was in profound, deep hypnotic sleep, head lying relaxed and back on chair. At this point he began suggesting very quick and deep abdominal breathing, with lips closed and nose open, declaring that breath was the power of song. His next step was a command: "Arise, you always wished to be an opera singer, now you are the greatest singer in the world." The Victrola, already adjusted at 76, was started on Mme. Schumann-Heink's record of "The Rosary." The subject with eyes closed arose slowly, with the help of Mr. Munter. In less than thirty seconds she began to sing in a very irregular way, then suddenly straightened up and burst forth into excellent rhythm, into as excellent an imitation of Madame Schumann-Heink as one could expect.

On consultation with Mr. Munter it was deemed best to bring her out of the hypnotic state and try the subject's voice with something that every one should be familiar with. With several vigorous shakes of her head and the statement that her mother was waiting for her, she opened her eyes slowly and began to laugh heartily. Although everyone in the room complimented her, she denied that she had sung—that she knew nothing of what she had done, and failed to recognize the songs. After two minutes of interrogation she was asked to sing "Home Sweet Home." Her rendition was so devoid of all the artistic points of the hypnotical reproduction of "The Rosary," wanting in all the requirements of even an ordinary girl's singing, the voice so piping and constrained, that it made all laugh. In seven and one-half minutes the subject was again put under hypnosis, and Mme. Guisippina Huget's record, "Mignon-Polonese" was started, but the patient did not seem to respond. In fact, the hypnotist did not seem to like the record and explained that the music was unknown to him, and that he could not suggest to her anything that he did not know, and that she could only receive what he was able to transmit. The record, "I

Love, Love You," from the Red Mill was selected. This record was attached and in forty seconds she began and continued until the end without a break in rhythm, and in a finished and finer form than the recording artist.

March 7: A meeting was held with Prof. Hallock and Dr. Muckey in which she sang for many hours under less favorable conditions—the gases in the colon seeming to prevent a complete hypnosis in spite of violent abdominal massage. In an hour's time, however, she was thoroughly under control and sang at least seven times in good form.

March 24: She was hypnotized in seventeen minutes and sang almost continually before several physicians and other folk from 8 p. m. until 1 a. m. At times there seemed to be physical exhaustion, but upon the suggestion of deep and rapid breathing she arose to the suggestion of song, in splendid shape and sang just as Mr. Munter, Dr. Muckey or myself suggested. Mr. Munter conveyed his power, each one compelling his idea to the mind of the singer, but I must say her rendition as a whole was better under Mr. Munter's influence for the reason that both Dr. Muckey and myself were more interested in the science than in the art, hence our suggestions were coupled with the desire for pure tone, while the hypnotist was for the art of the singer, of the song, and who knows, perhaps of the idea of the composer. It would seem from this singular and remarkable case that the hypnotic suggestive power of the pedagogue might be given often enough to have her realize by automatism just the necessary organic union between the psychology and the physiology of voice-teaching.

The great list of those artists who have gone before, with their great breath control, their phenomenal phrasing, their wonderful range, quality, and their various and magnificent attributes, attest that there always have been great singers and always will be. We examine their histories and find that there is a steady demand for a higher standard. Medical schools have given us line upon line and precept upon precept until we embody their sayings and start their systems of education upon the present results of these selfsame schools. The standard method adopted by our medical critics have forced us at present to read along certain lines that are most beneficial to our present state of living. Standardization only results from approximation of the real truth.

And now we arrive at the all important and vital question: *can we establish a different nomenclature from a medical standpoint?*

Singing teachers and laryngologists, as a rule, use arbitrary expressions to convey meanings which words as generally used do not, but a "standard system" no doubt would produce its own phraseology, provided more expressive and suitable terms could be coined. How shall this be done practically, so as to be appreciated and understood by all? First—by having a concert given by a soprano, and alto, a tenor, a baritone and a bass,—solo and ensemble. Stationed about the hall with cards of critical analysis, as per sample card already presented to you in this lecture, will be a committee of: (1) Ten voice teachers; (2) ten anatomical experts; (3) ten physiological experts; (4) ten psychological critics. Their findings and expressions dictated from their special view-points will be handed to a committee of grammarians from Yale, Harvard, Columbia, Princeton and Trinity who will read and review these criticisms from Victrola records, and establish a nomenclature for the world to use, so that we may establish for all to understand and to make progress, a conciseness and unanimity of expression.

In this little essay we have presumed to present a rather original grouping of so-called autonomies. I have referred to the autonomy situated between the nares and the soft palate. By calling this the "Em-en-ing" space, or autonomy, we will have done away with a huge number of inadequate words and terms formerly used in the description of this space, and at the same time we will have conveyed an accurate comprehension of it by the very sounds used in pronouncing the letters, bringing about the precise effect which is most desirable. By this method we could construct a new nomenclature or language, increasing its scope and defining it more accurately than it could have been done in any other way.

Take the next space, or autonomy, which has taken over ten lines to describe—from the lips to the soft palate, to the base of the tongue and posterior pharyngeal wall—this could be called the "phonoric" space, and the next the "pharyngic" or "resonantic," and the last, the "momentic" or "laryngine." All this gives us an accurate and concise idea of the different spaces in which distinctive vocalization takes place.

When it was found out that the reception could not be given to President Taft, and other severe features of the program would not be practicable, Miss Conlin, the daughter of an eminent physician, agreed to sacrifice herself at the altar of criticism, but inasmuch as in all these great occasions, "Man proposes and God disposes," all thoughts of criticism were lost in the beauty of her singing,—although no one noticed the fact that one month before

this event she had the turbinates removed, a sub-mucous resection for an enormous deflection of the septum, which facts no one noticed, nor called attention to the defect in her singing, so absorbed were they in the beauty of it. This operation was performed just one month before her appearance at this meeting and this was the first time of her appearance in public following the operation.

Vocal art science stands for the consummately true and beautiful in singing. In it are joined the God-given intuition that we call Art, and Science, which is the exact knowledge of *cause* and *effect*. Science arrives at the same conclusion as Art intuitively grasps, but Science laboriously works its way to the point, while Art is transported thither on the magic carpet of the fairy-tale. Art is to singing what the soul is to the body. Science is sure, even when, as must often be the case, inspiration, the breath of life to Art, is lacking; and finally plodding Science can often awaken sleeping Art under the most adverse circumstances.

However, neither vocal art, nor vocal science is sufficient alone. That art is most perfect whose basis is science,—and who shall say where art begins and science ends? The singer must weld art and science into indissoluble union. He who does this practices the most exquisite and ennobling of arts, giving messages of inestimable uplift directly to the human soul; he is the true exponent of *vocal art science*.

If, with the perfected oscillograph, and the telegraphone, we can record and produce, at will, all the tones of the human voice, with all its ramifications of timber and overtones; if we can construct scales of perfect tones, such as would be sung by a Melba or a Caruso; if we can combine with this the kinetoscopic representations of the artists singing these tones, and the x-ray photograph, when this has been done,—then, it seems to me, the millenium of vocal art science will be at hand, for a real standard of voice-production will have been established.

To the brave of spirit, to the steady of purpose, to the earnest of endeavor, then, are presented these observations upon *vocal art science!*

SUMMARY OF SUGGESTIONS DEVELOPED FROM THE STUDY OF VOCAL ART SCIENCE AND TONE STANDARDIZATION, FROM THE STANDPOINT OF USE AND ABUSE OF THE VOICE, IN CONNECTION WITH WHICH THE FOLLOWING FINDING IS PRESENTED:

(1) Suggestion of a natural basic law for a standard pitch of male voice C^{512} and C^{1024} for female voices.

(2) Establishment of phonetic values for turbinated bones, dome of pharynx, hard palate and epiglottis.

(3) Demonstrated before Convention that removal of both middle turbinated bones, where in male and female voices the "G" overtone had been destroyed by double frontal and antrum sinus trouble, and hypertrophy with poor drainage, restored the overtone "G," developing magnificent overtone and fundamental at B♭ as shown by these two cases at the Convention.

(4) Developed the fact that vocal cyclones detonate in the nares and cause special reinforcement of overtones in dome and turbinated resonating spaces, by particular apparatus, in which the cyclonic movements of smoke in the cavities, showed the desired results.

(5) Developed the possibility of limiting the compass of the human voice from C_2 to C^3, because after that period of the scale, overtones are inharmonic.

(6) Developed the idea of five vocal units in voice production; that these units are automatic and, when combined with psychologic action, correct voice is produced, by simplifying augmenting methods already in use.

(7) Demonstrating by four cases of mutation, the possibility of mutation in causing subsequent development of turbinated ethmoid and vomer bones, as well as genital enlargement, occurring after marriage—at 29 in one case—and the usual development of those bones in mutation in those cases, especially the transformation of the retrorse conditions of the nasal bones into finely formed bridge; the complete rest of those cases for at least three years after mutation begins and the necessity of complete eradication of all deformities and all abnormalities at this period, especially tonsillotomy, with the eliptical bevelled MacKenzie after forced expression, always leaving capsule intact or in correct condition.

(8) Special illustration of psychic voice, allowing sleeping art to be liberated and brought forth by hypnotism.

(9) Inspiration through nose, using psycho-physical sense of smell, causes contrapuntal poles of control at nostrils and sphincter ani, their influence is concentrated at the middle of the manubrium, the cyclones of air generated at the cord with detonation into mouth and nostrils, thence converted into articulate sound and reinforcing resonance by oral and nasal cavities.

(10) *In voice production there are five voice units to be considered, which are governed by the medulla and brain:* (a) Nasal or resonatic autonomy, or first voice unit; (b) Oral or articulate; (c) Laryngeal or momentic, where the momentum is developed; (d) The thoracic or gaseous, the bellows part of the voice; (e) The abdominal or semi-solid support of the voice.

We have the first voice unit (nasal or resonatic autonomy) when the physiological control depends upon the contrapuntal poles of power at the ends of the nasal cavities. These are situated, first, at the opening of the nostrils and the closures of the palate. Its point of poise, or mechanical center of resistance, is at the bridge of the nose.

The second voice unit (oral or articulate) is physiological control depending upon the contrapuntal poles of power at the ends of the oral cavities: (a) At the lips; (b) at the junction of the tongue and palate, against the posterior walls of the pharynx. Its point of poise or mechanical center of resistance, is at the arch of the hard palate of the mouth, on the level of the eye teeth.

The third voice unit (the laryngeal momentic cavity or autonomy) is momentum developed by air against the vocal cords. Its physiological control depends upon the contrapuntal poles of power, the vocal influences of which are felt between the crico-thyroid niche and fifth vertebra. Its point of poise, or mechanical center of resistance, is at the crico-thyroid niche.

The fourth voice unit (or autonomy) is the thoracic, gaseous or bellows-like cavity, which contains everything between the vocal cords and the diaphragm. Its physiological control depends upon the contrapuntal poles of power; (a) at the vocal bands; (b) at the diaphragm. The point of poise, or mechanical center of resistance, is in the manubrium, or breast bone.

The fifth voice unit (the semi-solid supporting autonomy) is confined between the diaphragm and sphincter ani, the physiological control of which depends upon the contrapuntal poles of power; (a) at the diaphragm; (b) at the sphincter ani. Its point of poise, or mechanical center of resistance, is at the umbillicus or navel.

The combination of units by mental control gives us the cavity between the nostrils and sphincter ani, or end of spine, and its physiological control depends on the contrapuntal poles of power at mouth and end of spine. Its point of combination of the various units of poise, or mechanical centers of resistance, is at the center of the manubrium, or middle of breast bone, called by the old Italian School "Voice de pectore."

The psycho-physical senses, namely, sight, smell, hearing, taste and touch, are called into activity by inspiration through the nostrils, re-activated by its egress, thus affecting the aforesaid senses, so that by their correlation we have an added mentality or psychical force.

(11) Laryngo-pharyngeal observations inaccurately owing to lack of a standard.

(12) Physicians, physicists, teachers and performers must work together for harmony of ideas.

(13) Vocometers for measuring voices suggested in 1891 by me. Ear of the maestro should have the accuracy of a vocometer.

(14) Ignorance of any method and acquaintance with incorrect methods said by Mr. W. J. Henderson to be the most prolific causes of voice failure.

(15) How is tone produced? Correct voice analysis necessary. Standard system must involve control of physiological functions, coupled with command of the metaphysical.

(16) Marking scale should be 100 points—so much for each range, resonance, breath control, intonation, attack, volume, flexibility, agility, legato, mezza di-voce, articulation, pronunciation, temperament, imagination timber, etc.

First-class, 90 points; second, 75 to 80; third, below 75; voice producing mechanism one of valves, autonomies and polar centers of power.

(17) Caruso, Melba, the standard of vocal excellence at present.

(18) Diseased conditions should be treated and when necessary operated, in order to have throats clear for singing. In order to produce a standard, abnormal conditions must be considered, in order to arrive at the normal.

(19) Present nomenclature misleading and often meaningless, vocal art science will, of itself, evolve a better one.

(20) Committee of investigation needed to determine a new value to vocal apparatus, assigning positive pitch to partials. Human tone contains eight parts—fundamental overtone. 1. Octave made in thyroid cartilage; 2, at epiglottis; 3, octave by hard palate; 4, third in pharyngeal dome back of posterior walls; 5, octave by inferior turbinate; 6, fifth by middle turbinate; 7, diminished seventh, by superior turbinate, the frontal and sphenoidal sinuses, antrum, ethmoid cells and Eustachian prominences are auxiliary resonators for the upper partials.

(21) From the study and results of various operative procedures, it is necessary to establish a standard for phonetics and voice production.

(22) Causes influencing the autonomies: a—We may consider the depression of any of the hollow spaces, or autonomies, or any particular depression of same, likely to modify their size or form, thus changing the character of the sound produced.

(23) b—Anything which would occur within these autonomies to change a proper action of the nerves or muscles, or to interfere with a healthy condition of the mucous membranes, also the cleft palate, enlarged tonsils, stricture of the anterior nasal passage, or anything of a like abnormal character growing within posterior nasal cavities, as well as inflammations, which make it difficult to arrange autonomies in the usual and necessary way.

(24) c—The influence of diseased tonsils, swollen uvula, cystic growths, enlarged lingual tonsils, paralysis of the pharyngeal muscles, paralysis or tumors of the epiglottis. In this connection I might also add that false teeth play an important role in the modification of the natural production of sound from these autonomies.

The septum of the nose has an important role. For example, I call to mind one of my patients who said that there was something the matter with his nose, because in singing the termination of words ending in "ing" he found that he had a very disagreeable nasal quality, which belonged really to "nasality" than to nasal resonance. To illustrate: In singing the word "morning" it would seem to have a peculiar nasality. No matter whether he produced it with his finger applied to his nose, or whether he put other vowels before it so as to get it out, the result was the same.

On examining him I found that the tubercle of the septum impinged against the right middle turbinated bone, causing considerable catarrh and greatly aggravating, if not producing, coryza at times. The nasality disappeared entirely from his voice on the removal of the trouble.

Still another instance was that of an operatic tenor of prominence, in whom I noticed a tendency to break in scale sounding. This break was more pronounced at C^1 and at E^1 in the medium voice. In addition, he had a reprehensible tendency to give nasal or catarrhal color to all tones above E^1. I found an adenoid. It was quite as large as a good-sized hickory nut, and served to block up completely the dome of the pharynx. From this growth hung stalactic forms of mucous. At first he was unwilling to submit to adenotomy. A little cocain was applied and with a single sweep of the curette this singer was minus an adenoid. Within ten days his voice had extended from B^1 to the high D^{11}, and even to high E^{11} natural, which revealed to me the fact that the muscles and mucous membranes could draw the hollow spaces or autonomies into five or six additional spaces of required size sufficient to add five half tones to his voice.

If it is true that the tones of the voice are exclusively formed in the larynx and that the autonomies are nothing but reflecting resonators, that man could not have gained from the small operation the additional five or six tones. But the autonomies being necessary for the tone building of the additional tones and also being able to form after adenotomy was performed, five additional tones could easily and quickly be sung without the physician treating the larynx. In this case the larynx, or rather the vocal cords, vibrated easily for production of these tones, but without the proper autonomies the tones could not be produced. *Consequently, the autonomies must have more to do with tone building than is generally admitted to-day.*

Again, I had as a patient a singer in one of the Catholic churches; during a holiday festival her throat became filled with the smoke of the incense. This irritated her throat and caused a troublesome cough, which affected slightly the vocal cords, producing as well an absolute inability to form proper hollow spaces or autonomies. She lost her voice entirely

above the top F11. It required fourteen days to effect a cure. Then she stopped singing for six days and afterward sang in church, and the difficulty returned in augmented form. The succeeding week she wisely rested and a cure was perfected. However it might have been administered, rest did far more than any amount of medicine would have done in this case.

There comes vividly to my mind in this connection, a prominent New York singer who is a staunch advocate of my views. While on a concert tour he suffered from acute laryngitis and sought advice from a physician who honestly tried to aid him, without success however, because of injudicious use of the spray and lack of special knowledge and most effective treatment. He used menthol and eucalyptus as a curative in the spray, a combination affected much by a certain class with good intentions, which, for a time, gives to the throat a delightful sense of coolness. He stopped singing and lost nearly $1,000 in engagements. He then went to his room and to bed, where he remained for three weeks, his temperature being carefully watched. He was most careful not to expose himself nor to use his voice, and a perfect cure was the outcome.

As the result of years of practical observation, I am of the opinion that most, if not all, of the defects of voice-production are dependent on the relationship of the autonomies to the vocal cords; that the muscles and mucous membranes of these autonomies are generally the first ones to be afflicted. Resultant sicknesses, I have observed, are reflected to the vocal bands, in a manner peculiarly unique and systematic, to parts of the larynx, and from the appearance of the vocal bands themselves the physician is enabled to locate some of the troubles in the autonomies.

From what I have noticed, the frequency of nodes occur in the following order: (a) at C sharp; (b) at G sharp; (c) at F sharp, and (d) at B flat.

These keep a relative position in ascending the scale, showing that the tension and increased muscular energy that are brought to bear in the autonomies in upper note singing, create a like effect upon the vocal cords, beginning from the arytenoid to the thyroid end of the vocal cords. In brief, the higher the break in the voice the more anterior the development of the nodes in the vocal cords.

Despite the fact that the conclusions of celebrated writers seem to indicate that these nodes occur only at the junction of anterior one-third and posterior two-thirds of the cords, I have observed these nodules on five distinct cases.

I will cite here the method which I have followed in diagnosing: The patient is to take a position opposite the examiner, and the E scale is to be used. The method pursued is as simple as that of a man passing out on his own doorstep and listening to the sound of the approaching cars. In my own case, within a few yards pass the trains of the elevated railroad, the Sixth Avenue and Broadway lines. I am able to tell which of these cars is passing and the direction it is taking. In a way similarly intuitive, from continuous observation the debility of the patient will be revealed to the trained ear of the physician while displaying his vocal powers, in speaking or singing, and often by reaction on corresponding muscles in ourselves. I first make my patient sing the scale of E in single notes. This, it will be noticed, brings in G sharp and C sharp, which are vital points in the changing of our autonomies. Should the voice break at either point we will know whether the injury exists at the junction of the base of the tongue with the pharynx, or with the epiglottis, or whether this has been severe enough to cause a node at G sharp. By this break, I mean, in a cultivated singer, the perceptible change of voice in timber; I do not mean a change of the register of the voices. Should it be at C sharp, then we know that there is possibly some injury in the region of the soft palate, or in the pillars of the pharynx, or at the base of the tongue, or some follicular enlargement which interferes with the reflexes in the posterior wall of the pharynx. Should there be a blow-

ing sound down the scale, between G sharp and E, we must look out for thickening of the arytenoid or interarytenoid spaces. Should this be a higher voice, we will then try on the G sharp scale, and should the voice be unable to reach the portion of the scale above G sharp, then there is some difficulty with the pharynx, perhaps a post-nasal growth or secretion, which had interfered with the action of the muscles of the soft palate. Should the quality of the high G sharp be forced, we then direct the patient to sing through the nose. And if there be an inability to produce nasality by pinching the nose to get the interruption of sound, then we will know that there is some growth or some constriction of the cavity or caliber of the nares interfering with the auxiliary autonomies of the nasal cavity.

I submit to you one other case—a most wonderful instance of cleft palate, which nearly upset my observations of autonomies: This patient had a very marked cleft palate and by opening the mouth you could see the posterior nares in all its details. Her ordinary conversation was thoroughly blurred by the usual defects presented in such cases, yet she was able to sing a range from A flat to high E^{11} without any perceptible break, and that, too, in the beginning of her singing career, before a false palate had been introduced, which markedly helped her ordinary conversation.

The breaks, however, were, to a certain extent, visible in this voice from C^{1} flat to E^{1}, in the usual points of so-called change in registers. For a long time I could not reason this out, until the thought was suggested to me by Mr. Wangemann that the same condition was produced by the thickened oral wall so prominent in these cases, viz., dividing the air chambers in such a manner as to produce the same effect that she would have had had she possessed a normal palate.

(25) d—Autonomies even more than vocal cords account for the changes in quality and timber, registers or so-called passages in the human voice; vice versa, lack of harmony in muscular action and disturbances of mucous membranes governing autonomies must of necessity cause voice failure in formation of tone. Disturbances on the surfaces of autonomies are invariably reflected on vocal cords.

(26) e—It is an axiom almost that troubles in the higher resonator chamber (nasal cavity) reflect themselves in the anterior part of vocal bands. A lack of proper use of the post-nasal cavity will cause irritation or nodes, and if they be produced they will occur on the anterior end of the vocal cord.

(27) f—Disturbances in the middle, second or oral hollow spaces reflect their weakness upon the middle of the cords.

(28) g—In the lowest hollow space the same principle exists to create disturbances in the posterior end of the cords, especially if anything interferes with its normal position of pressing on the spinal column.

(29) h—A device for showing the possibilities of accomplishing the isolation of the different resonating chambers is shown by simple procedure as used by me. E! Ah! Oh!

In E the tongue closes off the oral and partly the laryngeal hollow spaces. Ah allows the oral space to vibrate and not the laryngeal. In oh we have all of the spaces in action.

This simple combination of vowels shows in a primitive way how a tone can be qualified or amplified through force applied to the vocal bands necessarily sustained by the actions of the autonomies. The action of the larynx alone cannot do this.

(30) i—Again, in my experience, it is almost axiomatic that troubles of the lower part of the body reflect their ills upon the anterior portion of the vocal apparatus and vice versa.

(31) j—It is a fact heretofore not known that the autonomies must be drawn, form and shape themselves into a proper condition for tone and production of voice, including pitch, *before* there can be any laryngeal action for the production of such tone.

(32) k—The timber, "klangtint" and quality of a tone and the character of its emittance is shaped, formed and sustained in any and all the different vowel sounds entirely in the autonomies, subject to and influenced by vibrations of the vocal bands; and I would like to state here that, while we *do* know that the vocal bands vibrate, the shape, form, manner, character and number of such vibrations for any given tone of and by the vocal bands are *not positively and absolutely known*, and must, necessarily, be a subject of investigation by physicians and physicists for years to come; for while there are a great many different assertions about the action of the vocal bands and larynx, the proof of the truth has yet to be made.

(33) l—Disturbances in nerves, mucous membranes and muscles necessary for action of autonomies are anterior and prior to muscular action of larynx and vocal bands, and severe disturbances of mucous membranes, nerves and muscles in hollow spaces deprive the larynx of the possibility to vibrate for the production of proper tones.

(34) m—The action of the autonomies influences the vibrations of the vocal bands to such an extent that in different voices the vocal band action appears to be radically different, going even so far in one class of tone (falsetto!) to vibrate for tone either "whole" or "one respective two-thirds" in different individuals. In consequence, it seems evident that segmentation in vocal bands may be caused by the action of autonomies, but the manner and character of vocal band vibration or segmentation is still quite an unknown quantity to-day. In this connection, I may say that, in several very beautiful baritone voices, we observed that for the very lowest tones the vocal bands shortened, which indicates the exact reverse vocal band action of the present theories as generally held to-day.

(25) n—The superior laryngeal nerve supplies both motion to the larynx and sensation to its mucous membranes, consequently application of sprays to its mucous membrane will at first increase tension of the muscular apparatus of vocal bands and ultimately over-stimulation by spraying causes their collapse.

Suggestion of a possible influence of the peneal gland and pituitary body in the development especially of the nasal turbinated, ethmoid and vomer bones at the time of mutation.

Finally, combining this summary into the complete tests for the correct action of these autonomies, as indicated by a macroscopic study of nose, tongue, palate, chin, neck, chest and abdomen, will have abbreviated present systems of voice production, as well as added to their comprehensiveness, a matter which will, later on, be more fully gone into.

22 W. Thirty-first Street.

Local Anesthesia of Larynx by Nerve-blocking with Alcohol. M. PAVESI and E. CURTI, *Gaz. degli Osped. e delle Clin.*, May 30, 1912, p. 681.

The authors report excellent results. Before the injection, a 2 per cent stovain solution is injected to lessen the pain resulting when the alcohol comes in contact with the nerve. An anesthesia of from one to four days was obtained. There are no contra-indications to the operation. A few blood extravasations resulted but were of no consequence. ED.

REPORT OF A CASE OF APHTHONGIA.

DR. F. VICTOR LAURENT, PITTSBURGH.

Aphthongia is a very rare affection, only three cases having been recorded. The condition was first named and described by Fleury, but according to Kussmaul, the first case was recorded by Panthel of Ems in 1855. Fleury defined it as cramps in the territory of the hypoglossi, which set in whenever an attempt to speak was made and which rendered articulate expression extremely difficult or impossible. The cause is great emotional excitement or fright.

My patient, Lillie S., is 15 years old, tall and well-developed for her age, and has enjoyed good general health, although she was extremely nervous when she first came to me for treatment.

She has hypertrophied tonsils and adenoids and has had frequent attacks of tonsillitis. I hope to remove the tonsils and adenoids, but so far the patient and her mother both object strenuously to any operative procedure. The hypertrophied tonsils and adenoids are not the cause of this condition, but tend to prevent her from using her voice properly and increase her nervousness and diffidence. Her respiration was also very poor.

When 9 years of age she fell down a flight of steps and hit her head on the pavement, and while not injured apparently, she suffered a great fright. Before this time, she had had no speech-difficulty, but after this fall, on attempting to speak, the tongue would be pulled back and the lower jaw pulled downward and to the right side. This condition has lasted for six years, for when I first saw her she still had these symptoms and I noticed also that when she attempted to speak, the extrinsic muscles of the larynx supplied by the hypo-glossal nerve (the sterno-thyroid and thyro-hyoid) and the sterno-hyoid muscle fell into violent vibrating movements. This was only on the right side. Patient said she felt as though a hand was clutching her throat and pulling her tongue back and that she felt great pain when trying to speak.

Now, after six months, she says it does not hurt her at all to talk, the feeling of constriction in the throat has disappeared, and there is no muscular spasm, although there is still the backward traction of the tongue to a slight degree. She still has some trouble with the linguals and will have to remain in my care for further training.

The treatment used was massage of the offending muscles and teaching her to remove the strain from the laryngeal muscles by "bringing the voice forward." This was done by making the attack of the initial tone with the lips closed, (in which way only a pure head-tone can be produced) and afterwards using the head tones with the lips just far enough apart to permit of articulation.

Jenkins Arcade Building.

Acoustic Nerve and Salvarsan. GEORGE GELLE, *Rev. hebd. de Laryngol. d'Otol. et de Rhinol.*, Oct. 19, 1912.

Gellé believes that in the present state of our knowledge, mercury and the iodids are preferable in the treatment of syphilitic auricular lesions, while in nasal and laryngeal lesions preference be given to salvarsan as its effect in these cases is remarkable.

SCHEPPEGRELL.

Treatment of Acute Mastoiditis and Severe Otitis by Bier's Hyperemia. ESCHWEILER, *Ztschr. f. Ohrenh. u. f. Krankh. d. Luftw.*, Band 65, Heft 2-3, 1912.

The writer reports ten cases of severe mastoiditis that have been cured by puncture of the mastoid abscess followed by repeated suctions or, in the absence of a fluctuating mastoid abscess, by applications of the "hyperemia ribbon." This treatment is contra-indicated in: (1) Suspected cerebral complications; (2) labyrinthine suppuration; (3) so-called masked mastoiditis, where little or no suppuration of the middle-ear is present and where no abscess is formed over the middle-ear; (4) suspected sequestrum formation and cholesteatoma.

The treatment of mastoiditis by hyperemia has to be interrupted in: (1) High fever; (2) the absence of a marked improvement during the third week of treatment. The cases of mastoiditis most suitable for hyperemia treatment are those with abscess-formation above the mastoid plane or below its top (Bezold). GLOGAU.

EIGHT YEARS OF CHLOROFORM ANESTHESIA IN NOSE AND THROAT SURGERY.*

DR. CHARLES PREVOST GRAYSON, PHILADELPHIA.

When for a number of years one has obstinately defied the opinions and prejudices of his friends and colleagues about some unconventionality of surgical procedure, and when for this long time he has turned a deaf ear to their warnings and their prophecies of ultimate disaster, the time finally arrives when he must either cry *peccavi* and renounce his heresy, or else claim that his persistency has been fully justified. Perhaps it might be considered somewhat premature for me to make this claim now with reference to my use of chloroform as an anesthetic, but even if I avoid this possible criticism by postponing the claim for a few more years, it may not be too soon for me to offer you what I may at least venture to call a preliminary report of my experience with it. So general and deeply rooted is the prejudice in this northeastern section of our country against the use of chloroform as a general anesthetic, that I could not fail to realize when I began to employ it for this purpose that I was exposing myself to the shafts of criticism and I have been perfectly conscious throughout these eight years that the occurrence of some otherwise inexplicable fatality would at once put chloroform and myself on the defensive and that, to slightly alter the words of Thomas Jefferson, I would be forced by a decent respect for the opinions of my fellows to declare the causes which had impelled me to dissolve the bonds which had hitherto connected me with ether. As a preface to this declaration, I wish to say that my use of chloroform has been largely limited to the briefer operations of nose and throat surgery. I mean by these the removal of adenoid growths and of the faucial tonsils, the straightening of septal deviations, certain of the sinus operations and several tracheotomies. In giving you the reasons for my abandonment of ether, I do not propose to try your patience by dwelling at any length upon the relative merits and demerits of ether and chloroform as general anesthetics, for I think I may assume that if it were not for the immediate and remote dangers that have been attributed to it, chloroform would be regarded as

*Read at the meeting of the American Laryngological, Rhinological and Otological Society, May, 1912.

an ideal anesthetic for such operations as I have mentioned. Its inoffensive odor, its freedom from irritating effect upon the air-passages, the quickness not only of the narcosis that it produces, but of the patient's emergence from it, and finally the comparative, if not complete absence of the nausea, retching and vomiting that follow as a rule the administration of ether, all these features combine to make its appeal to both the surgeon and the patient a very powerful one.

Almost always, I think I may say, the entire upper air-tract of the patient who has a pathologic nose or throat is apt to be both hyperemic and hyper-sensitive, and, as a consequence of these clinical features, an anesthetic the vapor of which is irritating to the respiratory mucous membrane is objectionable. Such an anesthetic is ether, and although its disturbing effect may be partially overcome by preceding its administration with that of nitrous-oxid, yet this Tandem method of employing the two is apt to result in even an increase of the vascular engorgement which for several reasons is, to say the least, undesirable. Again, the post-anesthetic nausea and retching characteristic of ether narcosis certainly tend to promote and prolong a capillary hemorrhage that in their absence would usually quickly subside. It was for these reasons that I thought myself justified in disregarding for a time our local prejudice against chloroform and in satisfying myself as to whether or not it was well-founded. The time has lengthened to eight years, the number of operations in which I have used it has reached and passed 3,800, and I have yet to experience my first regret for having ventured to tread, what many seem to consider, the crape-bordered pathway of chloroform. And to do full justice to chloroform I must acquaint you with several risks to which I have subjected both it and myself, in spite of the fact that they might perhaps have been avoided. In our private work we naturally have for varying periods of time, one or two thoroughly competent anesthetists whose skill and care reduce the element of danger to the minimum, but in a general hospital where the official anesthetist may be wanted in a half dozen different operating-rooms at the same moment, we are forced very often to depend upon the young interne who happens to be attached to our service at the time. I have done this, not occasionally, but habitually, and therefore in the course of these eight years my chloroform anesthesias have been conducted by a series of twenty-five or more inexperienced young men. In addition to this risk, I have assumed another—that of not withholding chloroform in a number of cases that presented cardiac valvular in-

sufficiency. If in such cases there is an increased risk to be considered, it seemed to be entirely neutralized, or at least controlled, by a somewhat lighter anesthesia and a greater rapidity of operating. Finally, I have not limited the use of chloroform to children, but have employed it also in a considerable number of adults of both sexes.

I am quite aware that the mere statement that in all this time I have not met with a single accident, will not protect me from the criticism of those who have used and who know chloroform as well, or better than I do, and who have abandoned its use because of what have seemed to them good and sufficient reasons. Any opinion that is founded upon the results of personal experience, has its scientific value, but the opinion or the criticism that is merely academic, that is based upon a study of statistics and current literature rather than upon a personal and practical investigation of the matter that it concerns, although this sort of opinion may possess some abstract interest, it is wholly lacking in concrete, clinical value. And, therefore, I am venturing to give you my opinion of chloroform because it has at least the one merit of coming straight from the operating-room, and since I have frankly confided to you the several risks that I have taken, I think I may be permitted to tell you also the measures that I have taken to combat them. And these are connected with the patient, the anesthetic and the manner of its administration.

In the first place, the general condition of the patient, his aggregate vitality, has always been reckoned as closely as possible. Naturally there can be no arbitrary standard about a matter of this kind, but experience will usually enable one to make a sufficiently accurate estimate of the patient's physical strength to permit the making of a safe choice between two or more anesthetics. If, for instance, the patient shows in a marked degree what we ordinarily call "poor condition," if he is distinctly anemic or septic, or if he has been suffering from a long-continued, suppurative process such as would have rendered him a little more liable to what has been termed "delayed chloroform poisoning," then ether was always chosen. These several conditions had to be pronounced, however, to make me guilty of this infidelity to chloroform.

It is almost as unfortunate as it is remarkable that an article like chloroform which, for purposes of anesthesia, is presumed to be always of the same standard of chemical purity and physiological energy should display the inequalities that it does when produced

by different makers. If we compare the results obtained from half a dozen different brands of chloroform, all the product of reputable manufacturing chemists, we will find that they may differ quite noticeably in the amount required for anesthesia, the rapidity with which this effect is produced, its duration, the degree of irritation that they severally occasion, and their effect upon the circulation and respiration. It was because of this variation that after some months of comparative tests I finally selected one brand and have employed it exculsively since that time. And since it is extremely important that a freshly-opened bottle be used for each private or for each series of dispensary patients, the convenience of having it marketed in one ounce containers is by no means an inconsiderable one. The rapidity with which chloroform deteriorates when once exposed to the air, is well known.

Finally, and probably most important, the method of administration claims attention. From the beginning I have used the "open method" and have carried it out with the Esmarch mask. Instead of stretching upon this, however, a single sheet of thick lint, as is advocated by several expert anesthetists, I have always employed ordinary surgical gauze and, according to the age, sex, and condition of the patient, I have used from four to six layers of this in the attempt to adapt to each case the proportionate admixture of air that he should have. Although a two per cent strength of chloroform vapor may answer very well as a general rule, yet I think that there are many cases in which we may either lessen or increase this strength with advantage. Of course, there can be no such thing as mathematical accuracy in this matter when the open method of administration is practiced, but it becomes in time fairly easy to approximate it with sufficient closeness. I follow the advice of almost all the authorities in starting the anesthetic very slowly and in not quickening it until the patient's breathing has become of normal rhythm and depth. Even then I do not permit it to be crowded for any reason whatever. If vomiting should seem imminent, the skin becoming pale and moist, the breathing shallow, and the pulse scarcely perceptible, instead of pushing the chloroform as is the custom with ether in the presence of this threatened interruption, it is at once suspended and I wait either for the stomach to be emptied or for the retching to subside; and it is not until the color, respiration and pulse have regained their normal state that the anesthesia is resumed. The depth to which this is carried naturally varies according to the probable duration of the operation. It is always deep enough to preclude any possible shock and

yet not so deep that it will be unnecessarily prolonged beyond the conclusion of the operation. In fact, I am apt to be more pleased than disturbed if the patient gives noisy evidence of returning consciousness before I have quite finished.

This suggests, in passing, another advantage that chloroform possesses over ether, namely, that if the etherized patient comes out sufficiently to interrupt the progress of the operation, several minutes may be needed to get him under again, whereas, with chloroform a half dozen inspirations of the vapor will usually be sufficient to enable one to continue.

And now, I have only to add a few details of a general nature. It is almost self-evident that terror on the part of the child or any great apprehension on that of the adult patient will delay narcosis and increase the quantity of chloroform necessary to produce it. Moreover, unless particular care is observed, the screaming child with its exaggerated depth of inspiration is apt to carry a certain percentage of chloroform beyond the tidal into the residual air of its lungs, and unless the vapor is greatly attenuated by holding the mask at a distance from the face, the possibility of sudden toxemia may be dangerously increased. You are, no doubt, familiar with Henderson's views concerning the condition to which he has given the name acapnia. If, as he contends, carbon dioxid is the sole stimulus to the respiratory center, then it is easily conceivable that the excessive pulmonary ventilation associated with the struggles of an alarmed child may so reduce the carbon dioxid content of the blood that the possibility of apnea may become a probability. It is for these reasons, much more practical, you will admit, than sentimental, that I never grudge the several minutes sometimes required to allay a child's fear and quiet its cries.

In this connection it is of importance also to remember that the superior laryngeal nerve is, if you will pardon my using so venerable a figure of speech, the watch-dog of the lower air-tract, and that if this be subjected to such irritation as would proceed from too rich an anesthetic mixture, its powerful inhibitory action will be exerted not only upon the respiratory, but upon the cardiac centers as well. In explanation of my apparent rashness in using chloroform in cases of heart murmur due to valvular lesion, I need only state my belief that the valvular defect has very little contraindicative significance if the myocardium itself is above pathologic reproach. If, however, there should be any evidence of degenerative change or lack of vigor on the part of that muscle, I hope you

will need no assurance that I would not disregard the warning conveyed by these conditions.

Finally, to anticipate the question that I may be asked as to why I exposed my patients to the dangers associated with such a number of young and inexperienced anesthetists, I wish to say that I always make it clear to each new interne that it is I who assume the full responsibility of the chloroform anesthesia, and that therefore I do not expect his feelings to be wounded if I venture to utter an occasional suggestion or warning. At the beginning of his service with me each of them is shown exactly how I wish the anesthetic given, he is warned concerning every possible accident and is carefully instructed in the clinical signs that foretell the occurrence of each. And from then on the chloroform is not given solely by him or by me, but we give it together; it is an example of team-work, we both of us watch the patient's color and respiration, his finger is on the temporal and mine on the radial artery, and not only do our eyes watch the rhythm of breathing, but our ears listen to its smoothness and are intent upon catching any evidence of obstruction or irregularity. From time to time the pupil and other reflexes are tested, and until the last drop of chloroform has been given and the mask removed from the face, absolutely nothing is permitted to distract our attention from the patient's condition.

In conclusion, it must have become quite evident from all that I have said, that I think it much more prudent and infinitely easier to prevent accidents than to cope with them successfully should they occur. I do not believe that the cardiac failure and other more or less serious mishaps of chloroform anesthesia, however sudden they may seem, ever occur without both warning and provocation. In other words, I do not believe that there is anything treacherous in the toxic action of this anesthetic; but, if any man because of a few score or even a few hundred successful administrations of it is going to be lulled into a state of over-confidence and beguiled into the carelessness that is so commonly begotten of it, then it is he rather than chloroform that is to be held accountable for any unfortunate consequence. And I am perfectly willing that you should draw from this the very obvious inference that in my opinion many of the fatalities that have occurred under chloroform anesthesia have been attributable no more to the chloroform itself than to the carelessness or ignorance of those who have given it on those occasions.

In this connection and as a distinctly parallel case, I need scarcely recall to you the disfavor, the disrepute with which cocain was

threatened during the first year or two following its introduction. Death after death, we shrink from any calculation of the actual number, was laid at the door of this immensely useful but very much abused drug. Idiosyncrasy, that favorite refuge of incompetency and recklessness, was dragged forward again and again to explain, or rather, to excuse these often inexcusable fatalities, just as for many years past the status lymphaticus has been made to serve as the scape-goat for numbers of deaths that have been really due to the incautious handling of chloroform and other anesthetics.

Unhappily, the therapeutic efficiency of many of our most useful drugs is very closely associated with, if not dependent upon their power as poisons, and it has often seemed rather singular to me that instead of being content with the safety that is afforded by an appropriate measure of caution in their administration, we are so apt to turn to synthetic chemistry in the search for a substitute that will have all of the virtues and none of the dangers of the original drug. However successful chemistry may have been in providing us with such make-shifts, for they are seldom more than that, I scarcely anticipate contradiction when I say that nothing can ever completely substitute care and common sense. Emphasizing, therefore, the essentiality of these and all that they imply, and insisting upon the freshness and purity of the drug, I say in closing, that my experience with chloroform up to this time leads me to ask for no pleasanter, safer nor more wholly satisfactory an anesthetic.

1435 Spruce Street.

Role of Emotion in Stuttering and Lisping. CHERVIN, *Semaine Med.*, Jan. 24, 1912.

Chervin recalls that both surgical and medicinal treatment of stuttering have long since been discarded and the only remedies lie in education and the increasing age of the subject. As to lisping, it is often complicated with a sort of deafness comparable to Daltonism in the eye, the subject confusing e. g. k with t, sounds perfectly distinct to the normal ear. The education of subjects who lisp, be this from hereditary predisposition or some obscure organic defect, bristles with difficulties.—*Ex.*

SOCIETY PROCEEDINGS.

NEW YORK ACADEMY OF MEDICINE.

SECTION ON LARYNGOLOGY AND RHINOLOGY.

Regular Meeting, April 24, 1912.

JOHN F. MCCOY, CHAIRMAN.

(Continued from page 1316.)

What has been entirely overlooked by the rhinologist in the consideration of orthodontia is the important forces of the muscular tissues contained within the oral cavity, and those surrounding it. It would be safe to say that those tissues do more orthodontia than all the appliances taken together. If we should trace the development of the maxilla, for instance, to the early embryonic stages, we will find that it is closely associated with the development of the tongue. Thus we will find the tongue bud is given off at about the third week of embryonic development, and when the palate processes are given off, at about the seventh week, the tongue fills the entire primitive oral cavity—the stomodeum—and lies at the base of the brain. And as the palate processes continue to develop, they creep, as it were, over the dorsum of the tongue, and so are shaped and molded by it. The tongue, therefore, at this early period exerts the greatest influence upon the form of the vault. As development goes on, the tongue is the most important organ in maintaining the form and shape of the oral cavity and of all the bony structures surrounding it, until the time of eruption and functionating of the teeth, when it is assisted by them in this capacity.

On the other hand, you have all observed the effect of the lack of function of this organ; you are all very well acquainted with the narrow upper dental arch in individuals afflicted with adenoids. In those individuals that have to resort to mouth-breathing, the tongue cannot perform its normal function, since the mouth must be kept open during respiration, the vault of the mouth immediately begins to lose its normal shape, while the mandible is invariably somewhat widened in the molar region from the pressure of the tongue which is compelled to rest on the floor of the mouth. Another phenomenon that you are well acquainted with in connection with adenoids is the protruding upper incisors. But if you will remember that, due to the existence of mouth-breathing also, the lips fail to functionate normally, then you will realize to what extent these muscles affect the shape of the jaw-bones.

Therefore, by gradual stimulation and consequent reshaping of these bones, as is followed by the best practitioners in orthodontia, and by establishing normal occlusion, i. e., the normal mechanical relation of the teeth, as taught by Angle, the muscles involved can be given an opportunity to adapt themselves to their new environment and assist further in maintaining the normally established conditions. Only thus can we

hope for the successful accomplishment of all orthodontic treatment. While by rapid and forcible spreading of the upper dental arch, not only is the mechanical relation of the teeth disturbed, but a sudden condition is created for the muscular tissues which they are not prepared to cope with, and the final result, from an orthodontic standpoint, will be a failure.

DR. EMIL MAYER said that he would like to make a correction of the statement made by Dr. Corwin that he had never seen any reference in literature to the resiliency of the cartilaginous septum, and would like to call his attention to a paper entitled "A New Operation for the Relief of the Deviations of the Cartilaginous Septum," by Dr. Morris J. Asch, read before this academy.

DR. CORWIN thanked Dr. Mayer for the reference.

DR. HASKIN thanked the gentlemen for their interest in his paper, but regretted that the discussion had been so limited on the part of the rhinologists, and that Dr. Stanton should accuse him of a deliberate attempt to mislead anyone. Dr. Corwin's observation as to the resiliency of the cartilage when removed was most instructive, although it had probably not been noted except casually by most men. It shows conclusively that the cartilage is under constant tension in these cases. Dr. MacKee had seen these illustrations and said that the median sutures were open. Dr. Caldwell, even without seeing the plate, said that nothing else could possibly have occurred in these cases. It is well to realize that the illustrations only show the pre-maxillary suture. As for the work Dr. Staunton had done on the skull, the head was that of an adult negro and no one would expect to accomplish it.

Dr. Haskin said that he had three heads, aged 5, 8, and 20 years, under spreading apparatus, but they had been under operation for only four days and were not ready for demonstration. These heads would be shown in Philadelphia at the meeting of the Triological Society.

In regard to the question of expansion, he made no pretence to being an orthodontist. The question of whether the work is best accomplished by spring or by firm, strong screw-pressure, was one that was open to discussion, and if the men would stop and realize the point, and think about it themselves they could easily judge for themselves as to which is the more scientific. The models here show the spring and the screw methods. He had not presented his own opinions or ideas on the subject of rapid expansion. Drs. Heilman and Stanton seemed to think that the rapid separation could not be done. Dr. Haskin said that he had letters from men who have been doing this work for years, and the testimony of such men as Dr. N. M. Black and Dr. Brown of Milwaukee, Dr. Strong of Bridgeport, Dr. Bogue, of New York, Dr. Barnes of Cleveland and others who demonstrate that it can be done is surely worth consideration as they have been using this method for many years.

No man who studies bones long enough will question that if the alveolar processes are moved widely outward, the teeth must pull apart the walls of the nose and the walls of the antrum. In several skulls, he has separated the median suture with his thumbs, applying pressure against the alveolar processes.

As for the question of getting nasal relief with slow spring expansion, he does not believe in it. That is a purely personal feeling, for if one is going to move teeth to secure nasal width, and that is what is desired, the apices must be moved out. If you tilt the teeth, you will lessen the apical arch and thus lessen the nasal space, for the apices of the teeth will be forced inwards. You may get an enlarged coronal arch in this manner, but where the teeth apices have been formed, you will get a diminution of the nasal space, rather than an enlargement. Another question is as to the backward movement of the teeth. In the skull shown, if you attempt to use the first permanent molars as the anchors for the spring arch to force the teeth out, any attempt to move them that will force the molar back, even one millimeter, will cause still greater impaction of the second and third molars and will greatly increase the distress of the patient. The skull shows very clearly how the maxillae have failed to develop downwards and forwards and this failure has caused impactions of all four molars, the bicuspids and the lateral incisors. The following letters are evidences of what other men feel and as said before are surely worth considering.

Dr. Black writes that Dr. Brown has been doing rapid spreading for him for fourteen years and that the cases run up in the hundreds. He says that in every case the deflected septum has been straightened out when the patient was seen early enough, and had remained straight. This straightening did not take place when spurs had been thrown out, the spur apparently interfering with the resiliency of the cartilage. He is convinced that it is perfectly permissible to alter perfect occlusion in order to obtain greater width and increased breathing space.

Dr. Bogue writes me as follows: "You are quite right in your attitude as regards the influence of orthodontia upon the nasal passages. Frequently the spreading of the dental arches also corrects crooked nasal septa—especially if the spreading be quickly done and the teeth be moved bodily apart and not merely tipped, and if the septal crookedness be horizontal. I have had considerable experience along these lines, sometimes having as many as twenty or twenty-five cases at one time and I have come to look for nasal improvement now in all cases save those in which the force employed is so gentle as not to be perceptible excepting after some weeks of application. In all the cases of rapid spreading, especially where screw-pressure was used, I have yet to find the first case in which nasal improvement was not immediately perceptible to the patient. This statement refers to arches that were enlarged by moving the teeth bodily *en masse*, not by tipping them sideways individually."

Some Observations on the Treatment of Chronic Inflammation of the Nasal Accessory Sinuses. By C. G. COAKLEY, M. D.

DISCUSSION.

DR. HARMON SMITH said that he disliked to offer his few experiences in comparison with Dr. Coakley's as evidence of any positive conclusions, but that one was bound to be influenced more by his personal clinical experience than by the observations of others. In his clinic in the Manhattan Eye, Ear, and Throat Hospital, for a number of years, even when the reader of the paper advocated more ardently than now the external

method of operation, the unwritten law of the clinic was that no external operation should be performed until all internal measures had proved unavailing and ample time and perseverance had been expended upon each case. The vast majority of these cases had all recovered under internal operation and treatment.

After the advent of the X-ray, it was possible to determine accurately the amount of space between the inner and outer plate, and he felt confident that the internal operation on the frontal sinus was one that could be safely performed by an operator having a thorough knowledge of the anatomy of this region. Curettage of the frontal sinus or of the tract leading to it was a mistake; the membrane was often destroyed and a periosteitis followed, which presented the beneficial results that are obtained by clean cuts.

He also disagreed with Dr. Coakley in regard to the internal injection of such substances as chlorid of zinc, lactic acid bacilli, enzymol and argyrol. One has to try out various medicaments, and where one of these does not succeed, frequently another will. He himself had tried lactic acid with poor results where enzymol would be productive of good ones. The secret of success, however, was frequent operation, and not doing too much at one time.

In his opinion, a good clean cut in this region was far preferable to using rasps or any of the curettes that were advocated. The curetting of the polypi from the antrum does not facilitate the healing process, for the pyogenic membrane remaining will create more granulations, and the mucous membrane has been destroyed where it is necessary to protect the bone. Ventilation and drainage are the two essentials to the curing of these cases; he prefers to douch these cases, and uses the Douglass douche. Bier's suction method is also a good method of treatment, if one does not employ too much force. If sufficient force is exercised to create a hemorrhage, the method is detrimental, but if only sufficient be employed to draw out the pus, very good results could be obtained if used in conjunction with other methods of treatment.

Dr. Haskin said that Dr. Smith's last remark had interested him very much, inasmuch as for years he himself had not operated on the nose intra-nasally for the treatment of acute inflammation of the ethmoids or other sinuses, having used suction with the vacuum-pump entirely. He had had several cases within the past few weeks—frontal sinuses, ethmoids, and sphenoids—all treated in this way. By using a silver catheter bent to suit the case and applying the vacuum-pump or suction-method one could obtain results that no blowing or spraying would produce. He had often employed Douglass' douche in the office, and afterwards there would still be secretions under the turbinate bodies, but by applying the catheter and suction one could draw out long strings of mucus and pus and the patient would be almost immediately relieved. There was a drying and shrinking of the processes and applications could be made directly. He generally uses a twenty-five per cent solution of argyrol. The suction-method was the most sanitary method of cleaning out the sinuses and the least distressing to the patient. In many instances it could be used without cocainizing the region. As soon as the mucus

was removed the mucous membrane would shrink down and give a large nasal space so that one could see the conditions in the nose. Of course, polypoid conditions were different, and would have to be operated upon.

DR. ABRAHAM complimented Dr. Coakley on his most interesting and instructive paper, and was pleased that the doctor had come back to the conservative operators among whom he counted himself. His first patient was operated on in the fall of 1897. Nearly every operation for chronic empyema of the antrum and frontal sinus was performed externally. These cases required not weeks but months to heal, some even running along for a year, or possibly longer, some passed out of his hands and no doubt were treated by some of you present. A few years later it occurred to him that intra-nasal surgery would answer in many of these cases, especially in cases of the antrum, and in 1899 he began intra-nasal work on chronic cases of the antrum, and since then has not performed a radical operation on the antrum. In his cases, last summer, the average duration of treatment was only three weeks. Some of these cases had been under treatment for years and some had been operated upon previously. He thoroughly agreed with the statement that in some of these cases the opening healed up quickly. He was now so conservative that he merely removed the lower border of the inferior turbinated bone to a sufficient degree to see the inferior meatus and not the entire anterior one-third of the inferior turbinate.

Speaking again of his private cases, he does not allow any of his patients to wash out the antrum, but does it himself, once a day. At the time of operation he curettes mildly all the exuberant granulation-tissue and polypoid masses, and depends on weak solutions of silver nitrate, perhaps as high as ten per cent, and in four to six weeks all of the cases are cured. In the acute cases simple opening and drainage is usually sufficient. He also agreed with Dr. Coakley's statement that the injection of antiseptics for diagnostic purposes should be discarded. This is especially true of hydrogen peroxid.

As for the ethmoids he does not operate upon them externally, as he had not seen a case demanding it. The great majority of these cases can be cured if the ethmoid is simply diseased, without involvement of the sphenoid and frontal. They may require from one to six operations to completely remove all diseased tissue.

He had under observation three cases of chronic frontal sinus empyema, of two or three years' duration, operated upon intra-nasally during the past year. These cases will run along for several weeks or months perfectly well until they contract a severe acute rhinitis; re-infection follows with purulent discharge, but under a few treatments they will clear up. In one case he has advised a radical Killian operation as he does not think the case will ever get well from the intra-nasal operation He believes in giving the patients the benefit of the doubt and prefers first intra-nasal operation and drainage. If after a given length of time the case fails to improve, then he performs a Killian operation.

Removal of the anterior wall of the sphenoidal sinus followed by local application, especially of nitrate of silver solution would heal the majority of these cases.

DR. EMIL MAYER expressed his pleasure at noting the swing of the pendulum to what may be believed to be the saner, safer, slower, and perhaps the more sure methods of intra-nasal operation, for the vast majority of these cases. It was a source of gratification to know that even so confirmed an external operator as Hajek was now inclining to what most of us have been hoping and preaching. Let us not forget, however, that there are occasions when the external operation has to be performed, that we sometimes have to deal with marked anomalies, and each case has to be studied from its own standpoint. One young man came to Mt. Sinai Hospital suffering from severe headaches and great rise of temperature every afternoon. A diagnosis of frontal sinusitis had been made before he came in, and this diagnosis was promptly and easily verified, except that there was no evidence of any pus on that side of the nose where he had the headaches. On the opposite side of the nose, however, there was a very large cystic turbinate, and he questioned as to whether or not it was best to submit the patient to an intra-nasal operation. Bearing in mind the experience of Killian and others who particularly caution against an intra-nasal operation if there is reason to believe that within a reasonable length of time you may be compelled to do a radical operation; he finally decided against the intra-nasal method and operated externally. He was very glad indeed that he had so decided when he found a frontal sinus extending almost to the edge of the eyebrow, running over to the oposite side. A remarkable feature of the case was that the frontal sinus was filled with a gelatinous mass, but no pus. A number of streptococci were found in the mass. A case of this kind was quite apropos in considering the subject before us, and Dr. Coakley would doubtless admit that such things should be thought of in deciding what kind of operation should be done. If he had attempted in this case to remove the middle turbinate, the patient would certainly have been put in a condition in which he was liable to be reinfected.

He wished to emphasize his gratification that these intra-nasal operations had been shown again to be so lasting and so satisfactory.

DR. YANKAUER said that the question of intra-nasal operation on the antrum had been settled some years before. When we first began to do the more radical intra-nasal operation, we had a number of cases which had been operated through the mouth and they continued to discharge for a long while, but this was controlled after the antrum was opened intra-nasally. Dr. Coakley mentioned that the nasal wall of the antrum has a tendency to close. He also had noted this, but had found a method which usually overcame that tendency. The closure of the nasal wall is due to the fact that the opening is not high enough, so that the natural orifice of the antrum is left intact. If you look at the natural orifice from the antrum side, the drainage of the secretions from the interior of the antrum takes place toward the natural orifice, the cilia of the epithelium move toward the natural orifice. If any of the inner wall is left, the tendency will be for the secretion to come out through the natural orifice and not through the artificial opening. If, however, the artificial opening is carried upwards and backwards, so as to include the natural orifice, this drainage is destroyed, and under these circumstances

the secretion must escape from the artificial opening, and it remains patent. It is not necessary to have the artificial opening level with the floor of the nose. It sometimes happens that the floor of the antrum is on a lower level than the nasal floor. In order to destroy the antral drainage, it is necessary to remove the anterior end of the lower turbinate, and he had always done so, but it is not necessary to remove the turbinate as far back as the antral orifice. But if the anterior third is removed and the opening continued upward into the middle meatus, the opening will remain patent.

In speaking of the opening of the cells, Dr. Coakley had spoken of exenteration. Dr. Yankauer said that he did not know what Dr. Coakley's practice was, but he wished to protest against the use of the curette in the ethmoidal region. It was not only dangerous but it was useless. If it were possible to remove all the mucous membrane so as to leave the os planum bare, the bone would never be covered with epithelium. It would granulate and form polypi. It was his practice in removing the ethmoidal cells to remove their inner walls, and to cut away the septa, using cutting forceps, being careful that they are sharp so as to cut through the mucous membrane without tearing. If that is done, and the mucous membrane of the outer wall of the cells is left in place, there is only a small area of bone to heal over, and a considerable amount of mucous membrane is left, which afterward assumes the function of the nasal mucosa. Some years ago he had devised an instrument for the removal of the anterior half of the naso-frontal duct, leaving the mucous membrane of the posterior half in situ. He had treated a number of cases with moderate success, but a large frontal sinus filled with polypi cannot be cured by the intra-nasal method.

Dr. Hurd said that he agreed with Dr. Coakley's paper in every respect. Last June he had read a paper on this same subject, which expressed practically the same views. One point, however, that he had brought out was that the polypoid varieties were not as a rule suitable cases. Much cannot be done for that condition through the nose. They will reproduce this inflammatory polypoid tissue, and a good many of them will have to be opened externally. Eight or nine years ago there were two schools, the radicals and the conservatives. The conservatives have trailed along, and some of the radical men have stated their views more clearly. The treatment of private patients is different from that of clinical patients. The latter want a quick cure, whereas the private patients will stand more manipulations and give more time to a cure, and one of the ideal features of private practice is the cure of an antrum without doing more than washing out with saline solution. He has had a number of cases that were cured without any operation—simply by cleaning them out thoroughly every day with saline solution. Bismuth paste is an aid in some of the sinuses, especially the sphenoid. He employs suction a great deal, not as a cure but as an aid; and after cleaning the pockets out as thoroughly as possible, he uses the bismuth paste, and has cured a number of sphenoid cases in that way. Another agent which he uses is nitrate of silver in strong solution, eight to ten per cent, going as high as fifty per cent. If that does not relieve after an inter-

val of some weeks, he uses a saturated solution of nitrate of silver. He has under observation a case which had been discharging indefinitely. Two months ago he performed a submucous operation, and washed out the antrum through the intra-nasal orifice. The man has two orifices, an upper and a lower. The cavity was washed out with a saline solution, four per cent, and a ten per cent solution of nitrate of silver some days after, using 260 grains to the ounce; this not proving efficacious, a saturated solution was used. Two weeks ago he returned with a dry nose.

Dr. Coakley was speaking about chronic sinuses, not acute ones. In a case now under observation, the patient had the sinuses on both sides filled with this productive inflammation, and they had been cleaned out by several men for two years. He did a double radical and she broke down with pus all through. There was a perfect bath of purulent secretion all over the nose, and no matter what he used the productive inflammation of the mucous membrane recurred. Then he gave her vaccines, using a stock vaccine, and after fifteen doses the pus had disappeared. The wound had broken down twice, but seemingly was now healed.

Dr. Cocks said that he would like to speak for a moment of the bad cases of chronic antral suppuration where the antrum is completely filled with polypoid material and pus. In these cases, he believes a cure cannot be attained by the intra-nasal operation. On the other hand, the old method of operating by the canine fossa route, removing the anterior bony antral wall, and packing the cavity to make it heal from the bottom by granulation, involves so much discomfort to the patient and healing occupies such a long period, that this operation has been discarded by most operators. Dr. Cocks said he preferred the Caldwell-Luc operation, which gives a good exposure of the antral cavity. It is his custom, when performing this operation, to make a large opening into the nose from the nasal floor to the natural opening of the sinus. At the same time a large portion of the inferior turbinate is removed. When the operation is concluded, the labio-gingival incision is sutured. No packing is required. If a sufficiently wide nasal opening be made, no difficulty is encountered with after-treatment. For cases of extensive polypoidal disease of the lining mucosa of the antrum, this operation seems a more surgical procedure than the intra-nasal method.

Dr. Douglass said that Dr. Coakley's paper contained the last word of our present knowledge of sinus conditions. He voiced the experience of the best operators, particularly in that strong sentence in which he said that the only method to be relied upon for a cure of chronic suppuration of the sinuses was surgery. If he were to add two words to that, they would be, "and drainage." There is only one method to be relied upon for the proper cure of nasal sinusitis, and that method is surgery and drainage. This branch of our art is shifting faster than any other, and what is true to-day is untrue to-morrow. We pray and hope that the truths of to-day will be the untruths of to-morrow, for there is no branch of our work that is so unsatisfactory as this sinus work. It was well enough to claim sure cures for sinus surgery but one never knows when they are really cured, for relapses are frequently treated by

a change of surgeons and the sinus cases, especially the clinic ones, drift about from hospital to hospital. From his own experience and that of his associates, he feels that it is better not to do operations on the frontal sinus if one can get drainage without operation, but *drainage is imperative.* When operation is necessary, the best results are obtained by the radical operation. If the sinus is small, an external operation does no harm, and if it is large, an internal operation does no good. It is well enough to be careful of the appearance of the patient, but the first thing is his welfare.

As for the antrum operation, he was usually satisfied with the intra-nasal method in private practice, but in hospital practice it had better not be done. Of course, there are exceptions to that, but the cases do not get along so well in the clinics. The radical operation of Luc is best.

The ethmoids and sphenoids had always been his betes noires, and still are. He would be very grateful to any one who would tell him how to treat them successfully. When he does the radical operation he is troubled forever by scabs, and if he does not do the radical operation he is troubled with discharge. He never knows which to choose, so far as the patient is concerned. The cases which give the least satisfactory results are those on the sphenoid and ethmoid, excepting of course cases of perforation and sepsis, where operation is a matter of life-saving. These views of Dr. Coakley are sound, and they should be applied, and all should try to work up to the standard which Dr. Coakley had set, but we must get past that to something still better than anything we have now, before we find anything that is really satisfactory.

Dr. Seymour Oppenheimer said that while it was true that the radiograph shows the relation which the ethmoidal tract bears to the other portions of the skull which concern us as rhinologists, yet it does not give the accurate information which is necessary to pre-determine whether a group of ethmoid cells are going to drain or not, after endo nasal measures have been tried. In several cases where he had employed endo-nasal surgery in cases where there were supra-orbital recesses (referring to cases that had been seen over a number of years, so that there is no question as to the facts) he was satisfied that much can be done occasionally even in some of these cases which according to the radiographic determination of the anatomical position of the cellular groupings, speak for external operation without subjecting the patient to an external radical procedure. The question as to whether endo-nasal methods or external ones should be employed is oft-times decided individually, for I think we all set our own indications, some more radically than others. The great trouble is that many men start off with radical views and soon become radical enthusiasts, and, seeing things from their own view-point the indications for radical surgery are in the majority of their cases present. The question which I ask myself, barring those cases where definite evidences exist for the performance of the external operation (referring to the frontal sinus), is are the results always more satisfactory than by endo-nasal methods? Certain it is I have seen a number of cases that have been operated by the most skilled and com-

petent surgeons, in which there has not been a cessation of nasal suppuration in spite of what was considered very thorough radical surgery.

DR. MCCOY said that his own views coincided with those of Dr. Coakley and he only wished to accentuate a few of them. Dr. Coakley had said that it was a delusion and a snare to operate on the frontal sinus and not touch the ethmoid cells. One of his own cases of brain-abscess which resulted in a cure was due to an attempt by another surgeon to treat the frontal sinus in this way which was followed by granulations filling up the naso-frontal duct, impaired drainage, and epidural abscess and brain abscess. That was due to the fact that the ethmoid was not touched by the method of treating the frontal sinus. He would like to know what was Dr. Coakley's experience in atrophic rhinitis operated by the external method. He agreed with Dr. Yankauer in what he had said about the antrum operation but did not coincide with his reasoning and had himself been getting better results when doing intra-nasal work on the antrum by going up to the normal orifice. He had succeeded in curing all his cases since adopting that feature.

DR. ABRAHAM said that Dr. Douglass seemed to think that he had made the claim that none of his cases were under treatment for more than three weeks, and then fell in the hands of other operators, whereas he had said distinctly that in the early part of his practice they were under treatment for weeks, months or perhaps several years—some of them got out of his hands after several years of treatment without cure. He had said, however, that during May, June, and July of last year he had treated eight cases of chronic empyema of the antrum and the average duration was three weeks of treatment, and though they have been under observation ever since not one has had a recurrence, a statement which he is ready to prove. Three had attacks of acute rhinitis since their operation without a recurrence of the empyema.

Report on a Case of Nasal Diphtheria. N. A. CHRISTIE, *Can. Prac. and Rev.*, Jan., 1912.

This is the report of a case of diphtheria in a lad of 17 years, where the usual throat condition was accentuated, and complicated by a cellulitis about the angle of the right jaw which pushed it forward to such an extent that the upper and lower sets of teeth were not in line. On the seventh day, when the pharyngeal membrane was loosening, a complete membranous cast was expelled from the right nostril followed by a profuse hemorrhage, which necessitated plugging. Subsequently pharyngeal paralysis, diplopia, numbness of the arms and legs, regurgitation of all food, etc., developed. Convalescence occupied four months. WISHART.

BOOK REVIEWS.

Handbuch der speciellen Chirurgie des Ohres und der oberen Luftwege. Edited by Drs. L. Katz, H. Preysing, and F. Blumenfeld. Band 1, Heft 2, Lieferung 1; price, M. 6; Band 1, Heft 2, Lieferung 1; price, M. 6. Curt Kabitzsch, Wuerzburg, 1911.

The second half of volume 11 of this exhaustive treatise on the special surgery of the ear and upper respiratory tract is before us and contains: (a) Mechanical bloodless treatment of stenosis of the upper respiratory tract, by Pieniazek of Krakau; (b) Cosmetic operations including: Prothesis, by Dr. G. Port of Heidelberg; Corrective operations, by Dr. Jacques Joseph of Berlin; Paraffin therapy, by Dr. Albert Stein of Wiesbaden; Plastic operations, by Dr. Ph. Bockenheimer of Berlin; (c) Roentgen diagnosis in oto-rhinology, by Dr. A. Kuttner of Berlin; (d) Phlegmonous inflammations of the upper air tract, by Dr. Edmund Meyer of Berlin; (e) General and special treatment of septic disease, by Dr. Kissling of Hamburg.

A. *The treatment of stenosis* is minutely recorded by Prof. Pieniazek, one of the pioneers in laryngoscope and bronchoscopy, whose research-work in this new field entitles this chapter to careful reading and special recognition.

He discusses the disposal of stenoses of the nose, especially those resulting from cicatricial contraction after ulceration and inflammation, as induced by syphilis, scleroma, congenital deformities; stenoses of the naso-pharynx; stenoses of the larynx and trachea and of the bronchi by bougies and other dilatation instruments through the bronchus; intubation and its various modifications of technic; stenosis of the larynx following tracheotomy and the various technical means of increasing the lumen of the trachea; tracheal fistulae and methods of dilatation through such artificial openings; the operative treatment of laryngeal stenosis after tracheotomy; and all the other types of contraction and alteration in the lumen of the respiratory tubes, both operative and mechanically non-operative.

Prosthesis of the defects in the region of the face and jaw that are not included in the more difficult plastic surgery, by means of the application of various mechanical devices and apparatus are considered by Prof. Dr. Port. Congenital and acquired defects of the palate and pharynx, cleft palate, replacement of sections of the tongue, artificial noses, replacement of lips and of cheek, artificial ears by means of plates, metal molds, obliterators and metal casts are presented in a most interesting, practical and minute form. There is more information in this monograph on prothesis of these areas than we have found in any text-book on special surgery.

B. *Corrective nasal and ear surgery, by Dr. Jacques Joseph.* Joseph classifies the deformities of the nose as follows: I. Hypertrophy of the nose (rhinomegaly). 1. Hypertrophy of the bony nose, either an abnormally convex profile or an abnormal breadth of the bony portion. 2. Hypertrophy of the cartilaginous nose: a. abnormal arching of the triangular cartilage; b. abnormal length of the nose due either to a hanging septum or to excessive length of the entire nose; c. various deformities of the wings of the nose; d. deformities of the tip of the nose. The crooked or oblique nose. Nasal defects.

This monograph by Joseph is one of the most complete in the entire series in this handbook; for he presents for the first time many of the original and ingenious plastic operations devised by this skillful technician. Joseph made an extensive study of this particular field of plastic surgery. Most of these operations were performed intra-nasally and bring into practical application all of the most approved principles of cosmetic and plastic surgery.

It is the first complete exposition of this delicate field of plastic surgery that has ever been presented in which the author clearly describes every detail of technic, the instruments and mechanical devices that have been constructed for this purpose, and many little "tricks" and "wrinkles" which previous authors have selfishly withheld from publication.

We take this occasion to congratulate our able confrere for his ingenuity, liberality and originality.

C. *Paraffin therapy, by Dr. Albert Stein.* Dr. Stein goes extensively into the question of paraffin prothesis in its application to the nose and ear.

D. *Plastic operations, by Dr. Ph. Bockheimer.* The author divides plastic operation on the face into: (a) autoplasty; (b) heteroplasty, and (c) alloplasty. This field is uncommonly diversified and the operative technic and methods employed are considered from every view-point. In the temporal, the cheek, on the eyelid, nose, ear, lip, mouth, hard and the temporal, the cheek, on the eyelid, nose, ear, lip, mouth, hard and soft palates, uranoplasty and staphylorrhaphy are given.

Hare-lip and Cleft-palate. With Special Reference to the Operative Treatment and its Results.

By JAMES BERRY, B. S., and T. PERCY LEGG, M. S. London. Pp. 341, with 242 illustrations. Price, $4.00. Philadelphia: P. Blakiston's Sons & Co., 1912.

The most important feature in an extensive surgical monograph is original work, and the volume before us presents the experiences of Mr. James Berry and Mr. T. Percy Legg, in a series of 154 consecutive cases of cleft-palate operation from 1894 to the end of 1911.

In this book is described in full detail the methods which have been found most useful in the treatment of hare-lip and cleft-palate. The authors prefer to operate on the hare-lip first and to complete the correction of the cleft in the palate when the child is older. Originality in operative technic, sound and good judgment in the selection of the time and condition of the operation, clear and terse description in the text and a series of remarkably well-executed drawings to illustrate the different steps of the operation, great variety in the hare-lips and cleft-palate described, and technical points developed by the authors characterize every page of this volume.

In addition to a truthful record of their own work, the authors present a consideration of other methods introduced for the correction of cleft-palate and hare-lip, by Brophy, Lane, and others, and have also added chapters on the embryology, anatomy and physiology of the lips and palate, the variations of hare-lip and cleft-palate, the training in articulation after the operation, and a valuable appendix of 154 cases of cleft-palate with a brief resumé of each case.

The illustrations and press-work are unusually fine, and the entire volume presents the best treatise on hare-lip and cleft-palate as yet published.

On the Physiology of the Semi-circular Canals and Their Relation to Seasickness.

By JOSEPH BYRNE, A. M., M. D., LL. B. First edition; Octavo; 569 pages. Price, $3.00. New York; J. T. Dougherty, 1912.

The author presents in this volume of 570 pages, six years of experience and observation on the etiology of sea-sickness and the relation of sea-sickness to this long-mooted question. The experiments on which these observations are based consisted in a series of attempts to stimulate sea-sickness by rotation, aural irrigation, light stimulation, galvanism applied to the mastoid region, etc. It also includes a careful observation of the effect of sea-voyage on the author and several selected subjects.

The remarkable development made in the past few years in the study of the physiology and pathology of the labyrinth justifies some of the

conclusions reached by the author in his assertion of the semi-circular canals as the causative factor in sea-sickness.

The author claims that his investigation of the phenomenon of nystagmus as produced mechanically, thermically and electrically was studied and worked out by him independently, before he had any information of the work done by Bárány, Neumann and others.

These studies in sea-sickness, and the deductions and conclusions which are reached are very interesting. The gyroscope is a possible means of preventing sea-sickness, if the principle of the gyroscope can be applied in conjunction with the swinging deck or compartment.

While no definite conclusions of practical value are reached in this investigation, there are, however, many avenues of thought and material for further experiment offered.

Practical Medical Series Comprising Ten Volumes on the Year's Progress in Medicine and Surgery. Volume III, The Eye, Ear, Nose and Throat.

Edited by A. Wood, M. C., Albert H. Andrews, M. D., and Gustav P. Head, M. D. The Year Book Publishers, Chicago, 1912.

We are always glad to see this annual visitor, for it presents in crystalized form the most recent developments in ophthalmology and otolaryngology, including anatomy, surgery, technic, new therapy and advanced thought in our literature.

For the busy specialist who neglects to read the progress in his field from month to month in the special medical journals, this little yearbook should prove an invaluable companion, and afford a means for further reference and an index as to where more detailed information may be obtained.

Primary Malignant Growths of the Lungs and Bronchi—A Pathological and Clinical Study.

By I. Adler, A. M., M. D. Pp. 325, with 16 plates. Price 16s net. London: Longmans, Green & Co., 1912.

The field which this volume presents is a rather new one in special literature.

The monograph was originally intended as a contribution to Prof. Arnold in honor of the seventieth birthday of this master in pathology.

Prof. Adler believes that these primary malignant tumors, while, infrequent, are by no means extremely rare.

Not only carcinoma, but also other mailgnant tumors of the lung are considered both from the broad pathological as well as from the clinical point of view.

A very large material has been collected from the literature in this field towards this accomplishment. In 1896, Passler managed to collect about seventy-four cases of undoubted primary carcinoma of the lungs. Edward Boecker, in 1910, remarked that 100 cases can now be found in the literature.

It is a very laborious and serious literary undertaking to collect such matter and to eliminate that which adds but little of statistic or scientific value. The author has been successful in this difficult task and has presented, both in analytical and tabular form, a series of 374 cases of primary carcinoma of the lungs, 90 cases of sarcoma, 99 cases of malignancy of the pulmonary organs of doubtful character, and 18 miscellaneous cases of probable malignancy.

The pathological and clinical chapters are splendid examples of careful analysis, sound pathological knowledge and lucid deductions. This monograph cannot fail to be a matter of much profit and information to all who carefully peruse it.